Chemical Demilitarization Work Group
TOCDF Risk Assessment Update
March, 1998

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Utah Division of Solid and Hazardous Waste

Introduction and Overview

- TOCDF Risk Assessment History
- Trial Burn Results and Interim Risk Assessment
- Future Risk Assessment

TOCDF Risk Assessment History

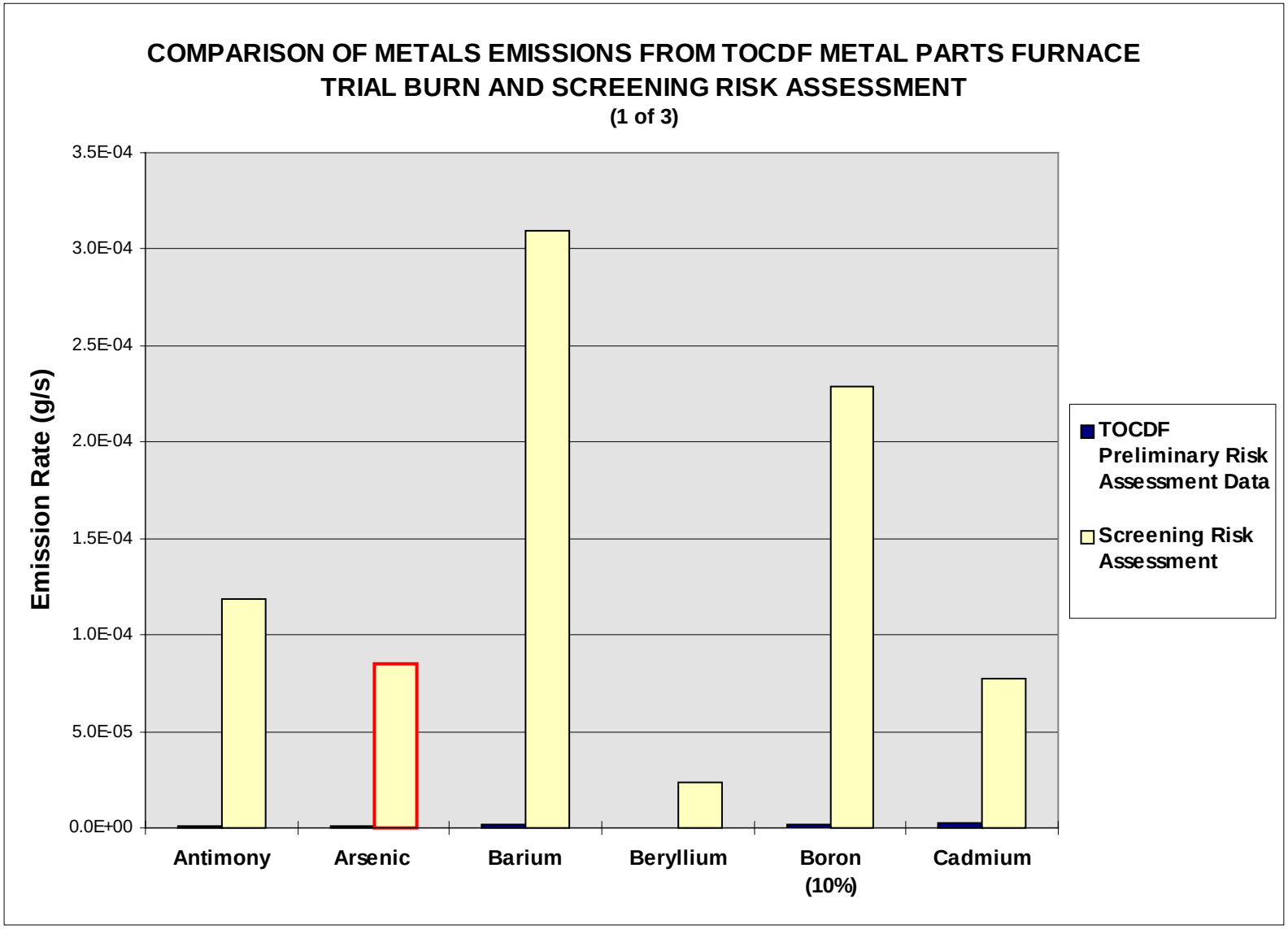
- Screening Risk Assessment; February, 1996
- TOCDF given permission to begin processing GB; August, 1996
- Trial Burns; 1997

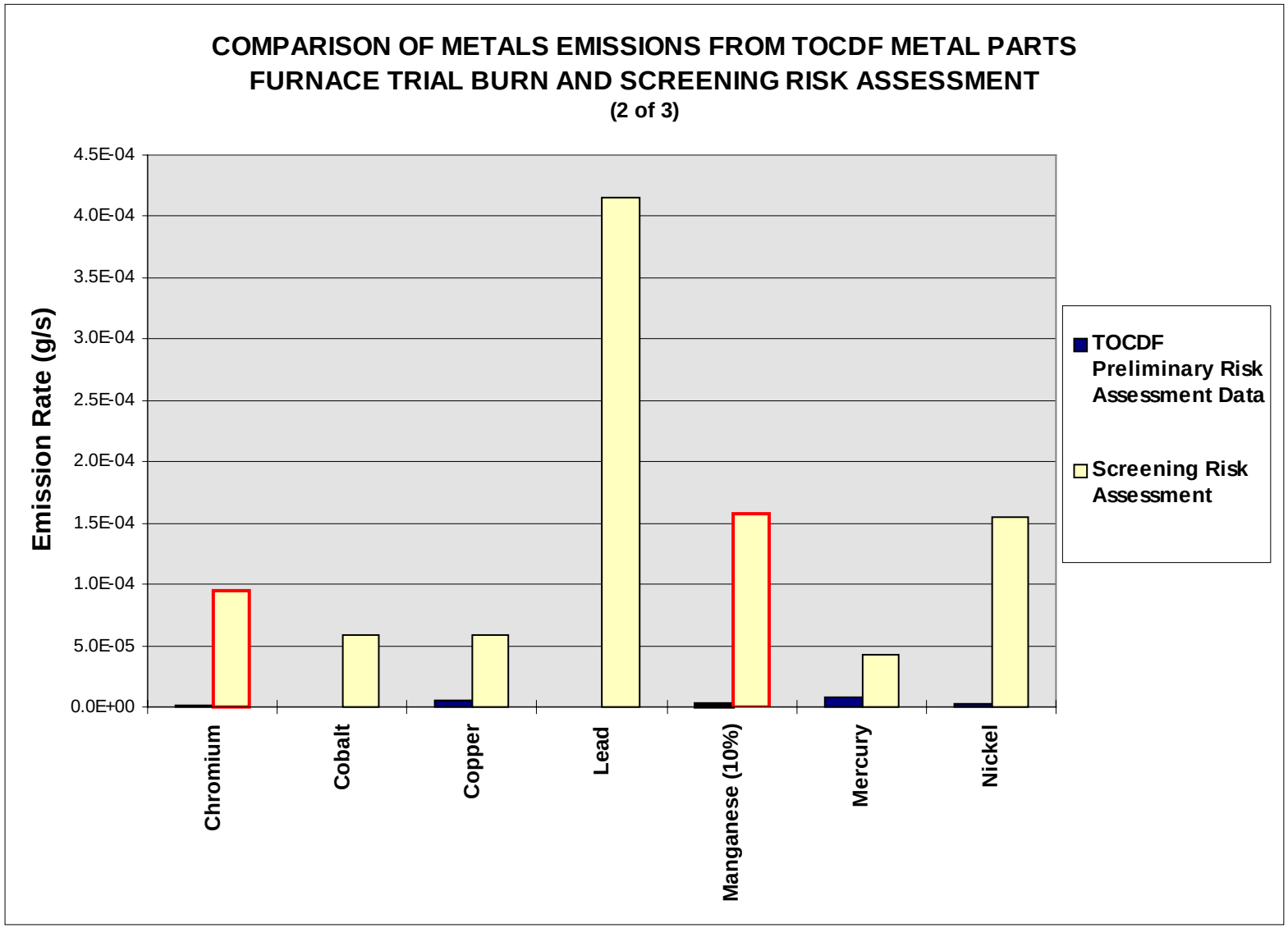
TOCDF Risk Assessment Sequence of Events

- Review Screening Risk Assessment using trial burn data; 1997-1998
- Update and Reissue Risk Assessment for each campaign; 1998 to ?

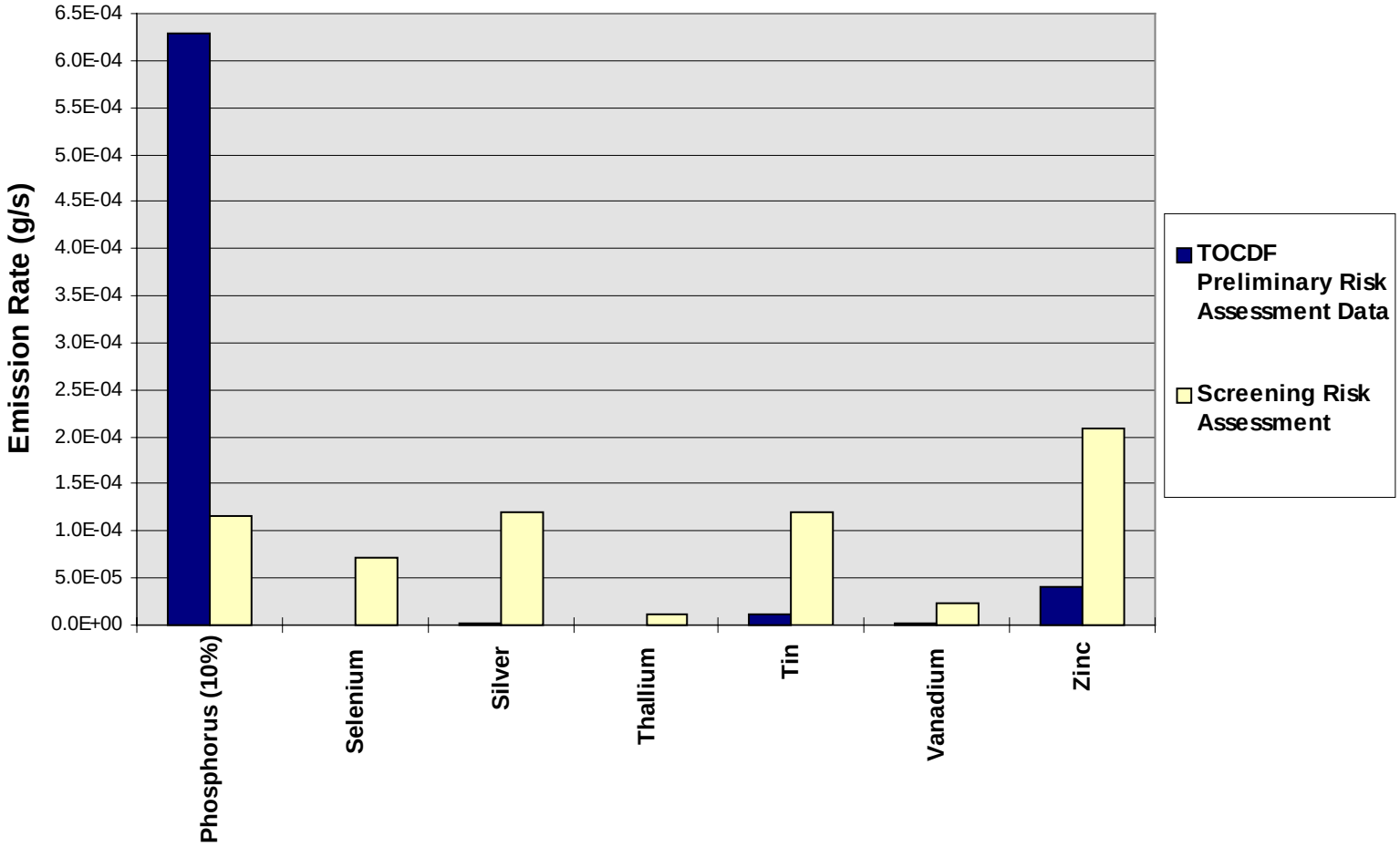
Metal Parts Furnace

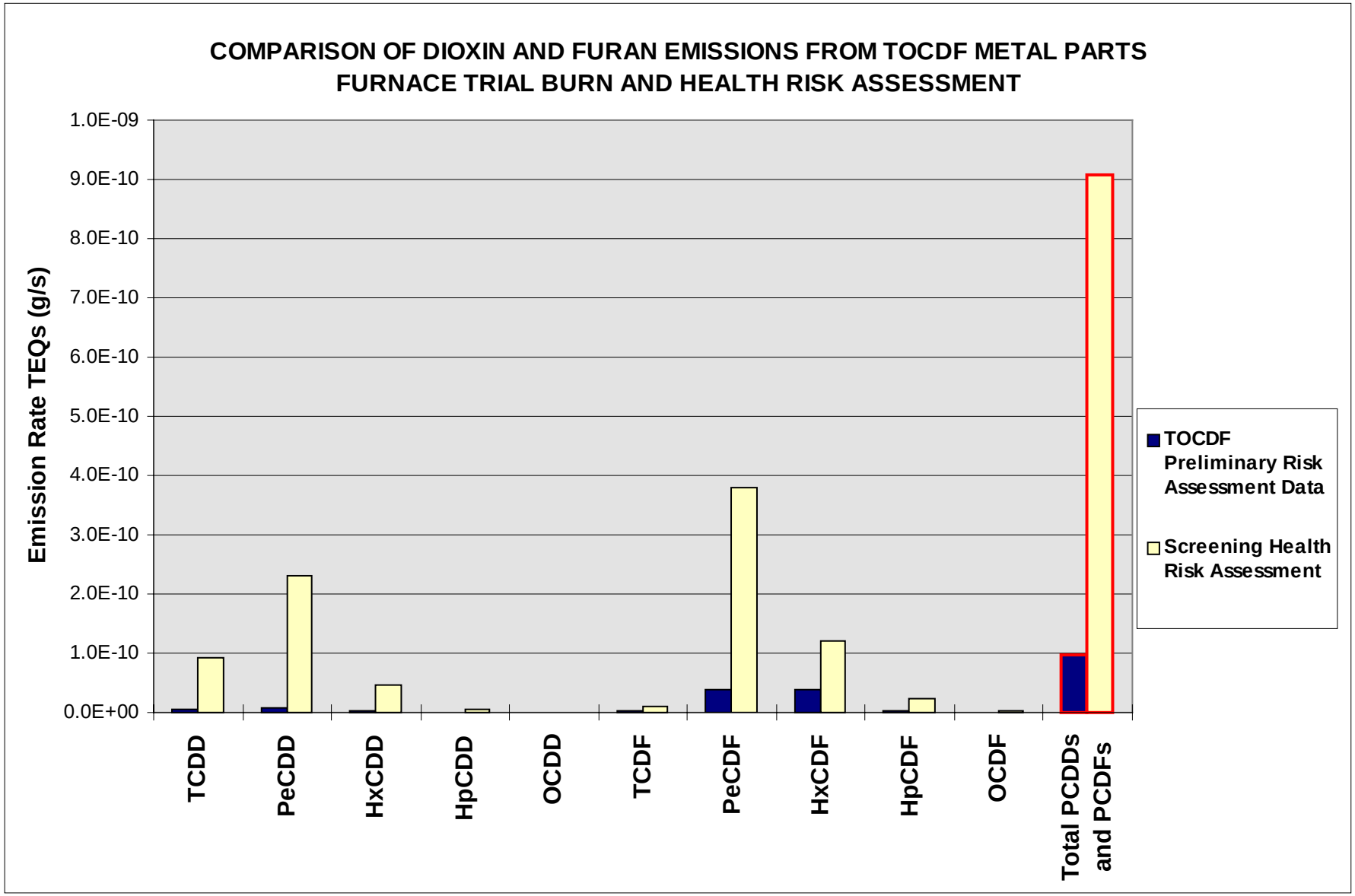
- Metal Parts Furnace is the source of 20 to 45 percent of total risk.
- Dioxins/furans, mustard (HD), chromium and arsenic are the most important chemicals because they contribute over 80 percent of the total risk from MPF emissions.


COMPARISON OF METALS EMISSIONS FROM TOCDF METAL PARTS FURNACE
TRIAL BURN AND SCREENING RISK ASSESSMENT
(1 of 3)
Emission Rate (g/s)
3.5E-04
3.0E-04
2.5E-04
2.0E-04
1.5E-04
1.0E-04
5.0E-05
0.0E+00
Antimony
Arsenic
Barium
Beryllium
Boron (10%)
Cadmium
TOCDF Preliminary Risk Assessment Data
Screening Risk Assessment

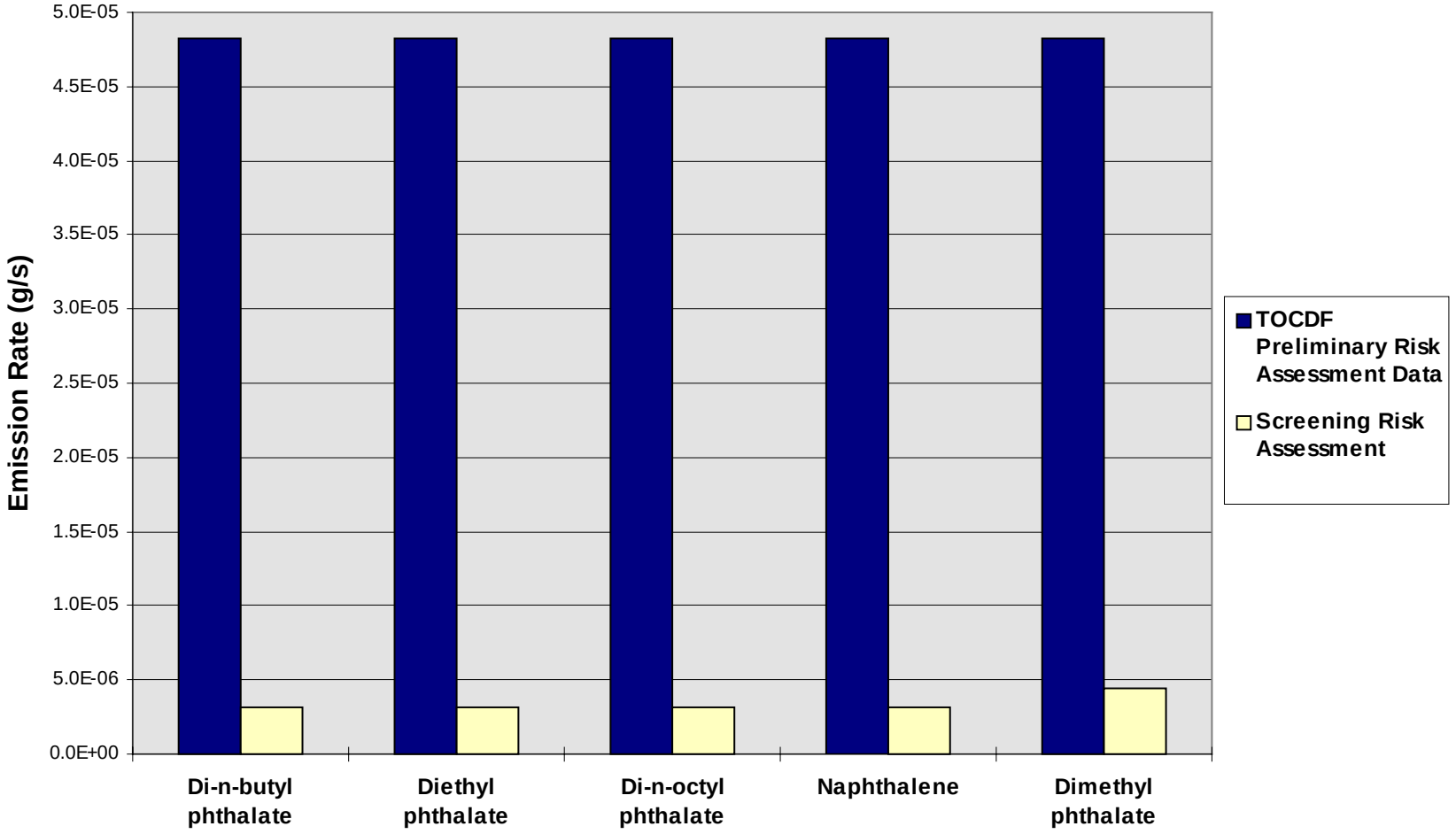

COMPARISON OF METALS EMISSIONS FROM TOCDF METAL PARTS FURNACE TRIAL BURN AND SCREENING RISK ASSESSMENT
(2 of 3)
Emission Rate (g/s)
4.5E-04
4.0E-04
3.5E-04
3.0E-04
2.5E-04
2.0E-04
1.5E-04
1.0E-04
5.0E-05
0.0E+00
Chromium
Cobalt
Copper
Lead
Manganese (10%)
Mercury
Nickel
TOCDF Preliminary Risk Assessment Data
Screening Risk Assessment

COMPARISON OF METALS EMISSIONS FROM TOCDF METAL PARTS FURNACE TRIAL BURN AND SCREENING RISK ASSESSMENT
(3 of 3)

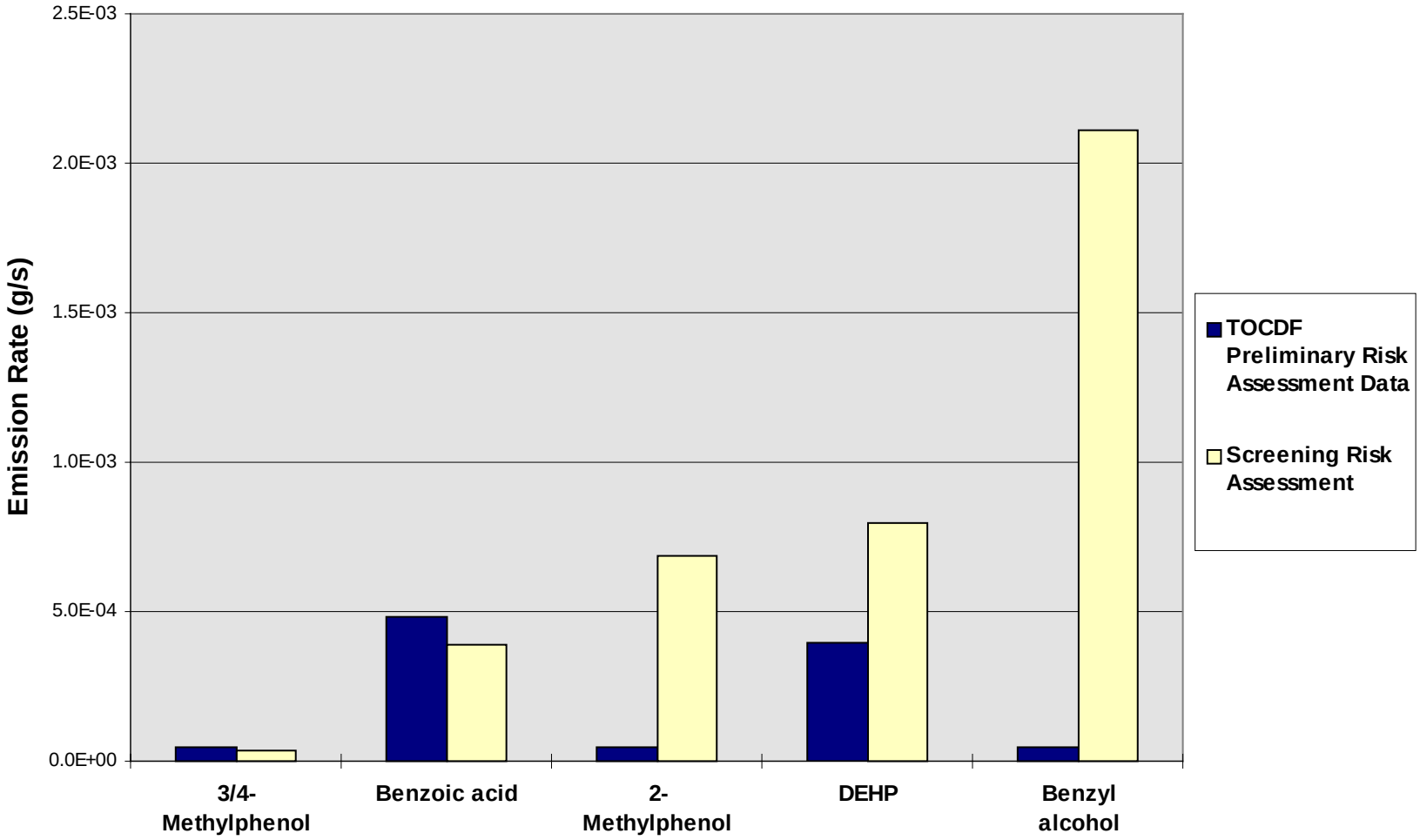


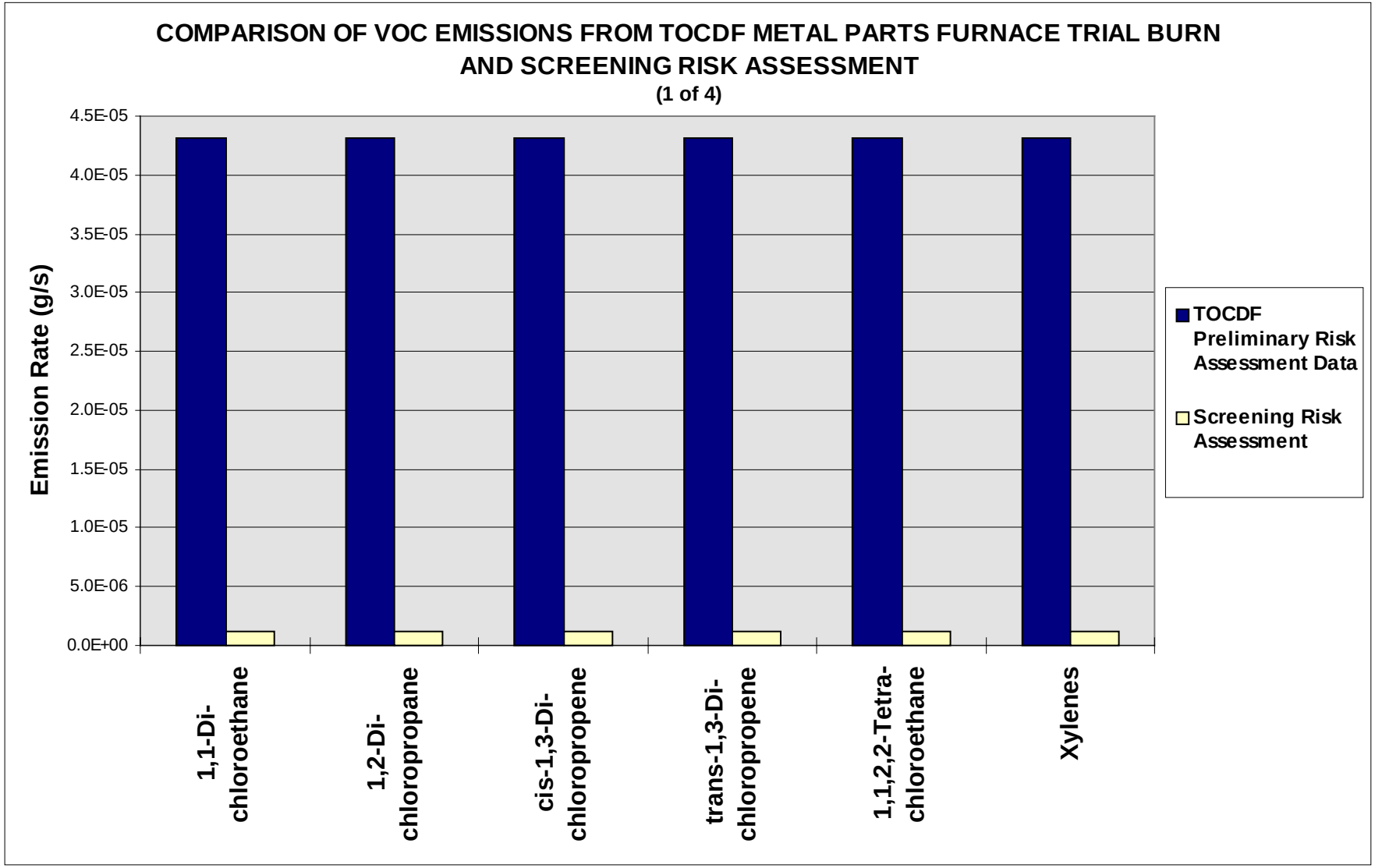

COMPARISON OF DIOXIN AND FURAN EMISSIONS FROM TOCDF METAL PARTS FURNACE TRIAL BURN AND HEALTH RISK ASSESSMENT
Emission Rate TEQs (g/s)
1.0E-09
9.0E-10
8.0E-10
7.0E-10
6.0E-10
5.0E-10
4.0E-10
3.0E-10
2.0E-10
1.0E-10
0.0E+00
TCDD
PeCDD
HxCDD
HpCDD
OCDD
TCDF
PeCDF
HxCDF
HpCDF
OCDF
Total PCDDs and PCDFs
TOCDF Preliminary Risk Assessment Data
Screening Health Risk Assessment

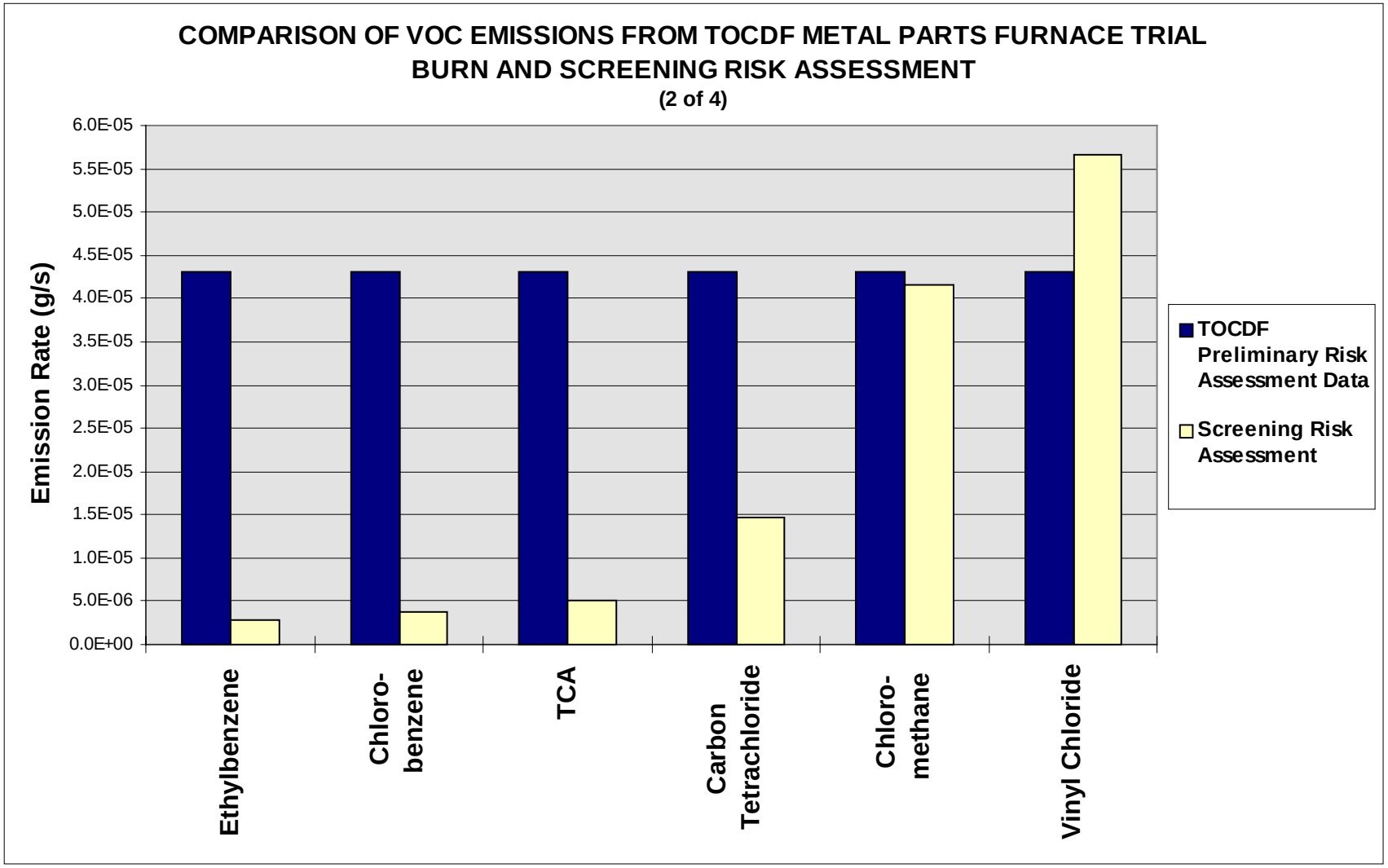
COMPARISON OF SVOC EMISSIONS FROM TOCDF METAL PARTS FURNACE TRIAL BURN AND SCREENING RISK ASSESSMENT
(1 of 2)

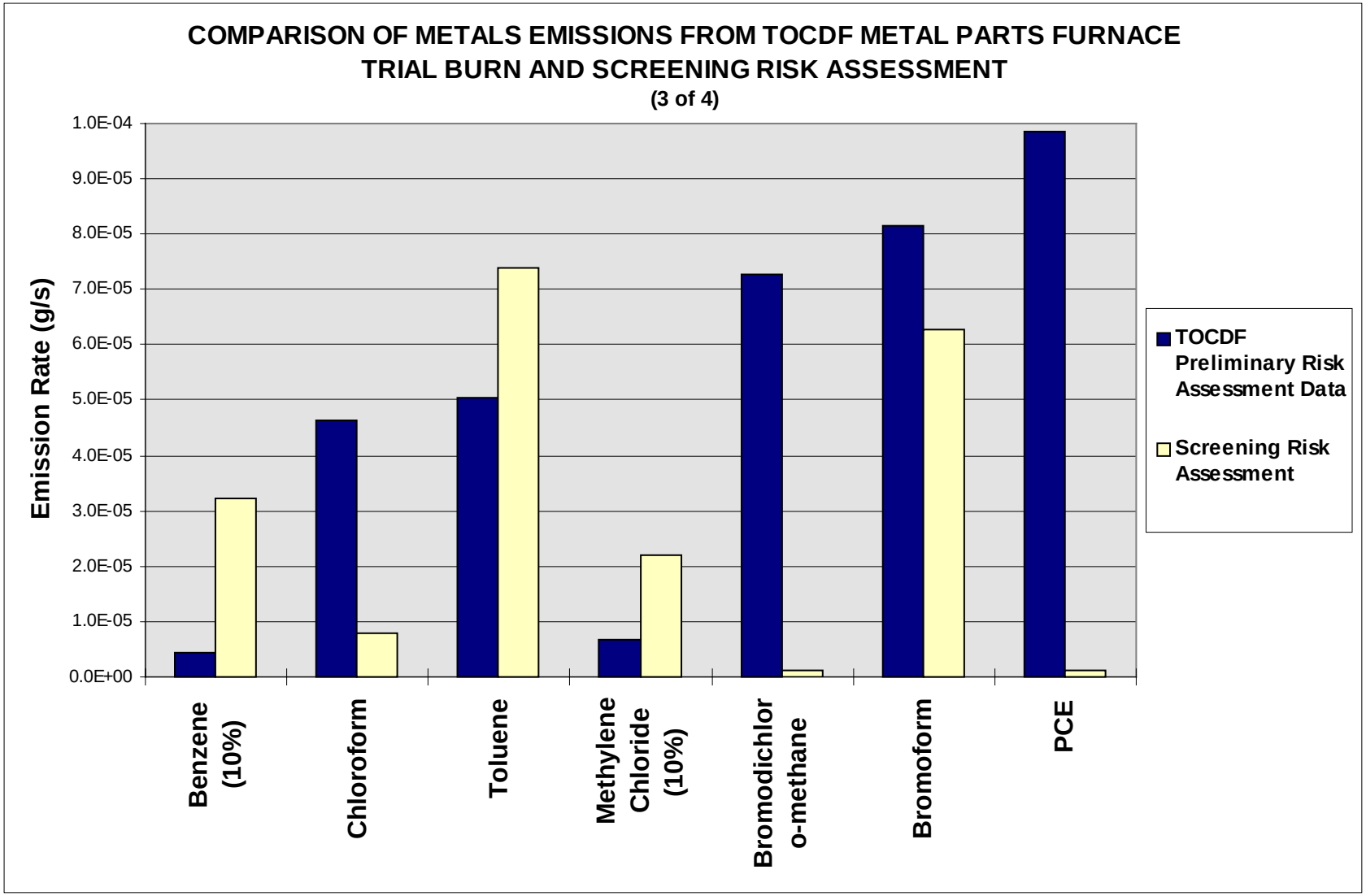


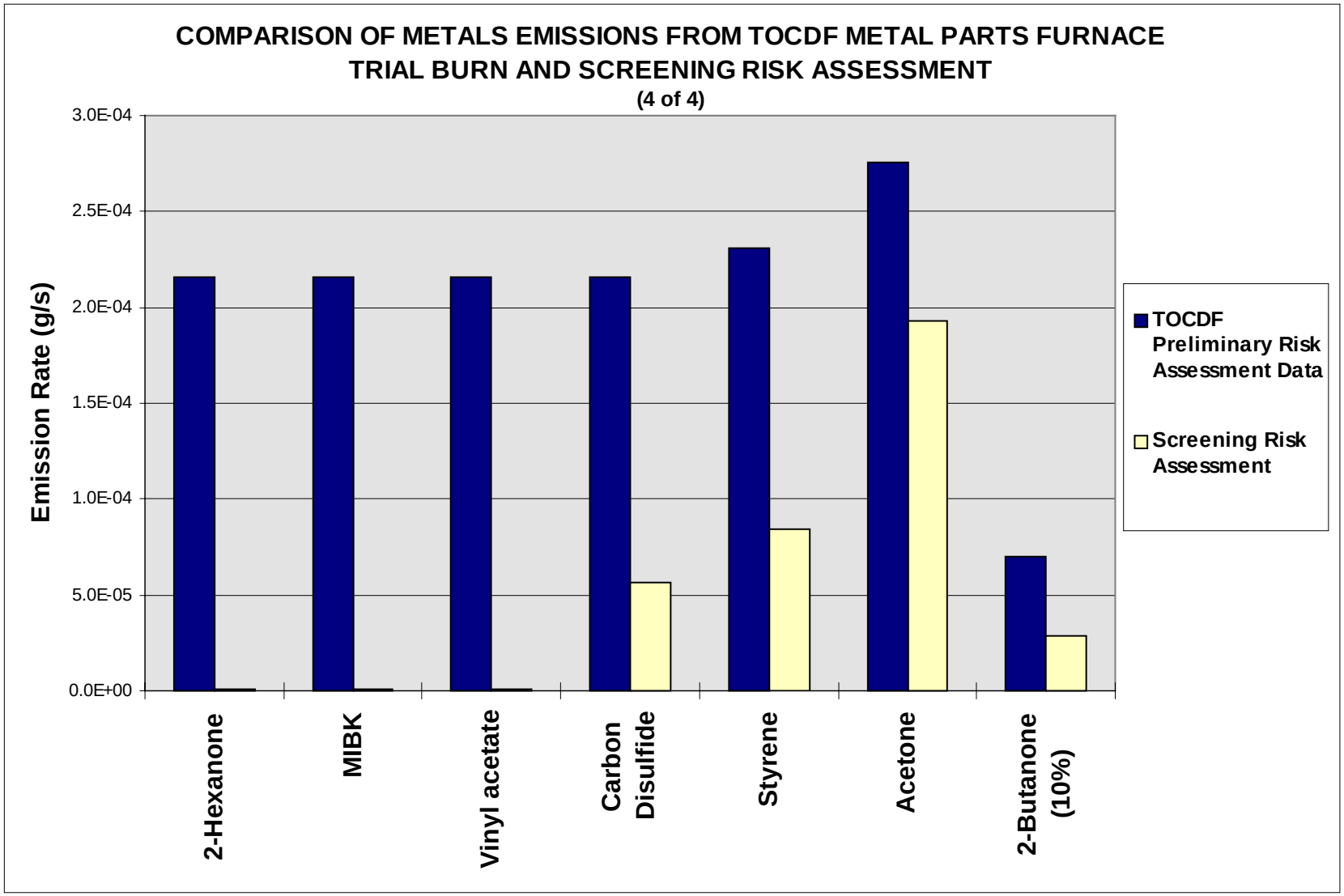
COMPARISON OF SVOC EMISSIONS FROM TOCDF METAL PARTS FURNACE TRIAL BURN AND SCREENING RISK ASSESSMENT
(2 of 2)



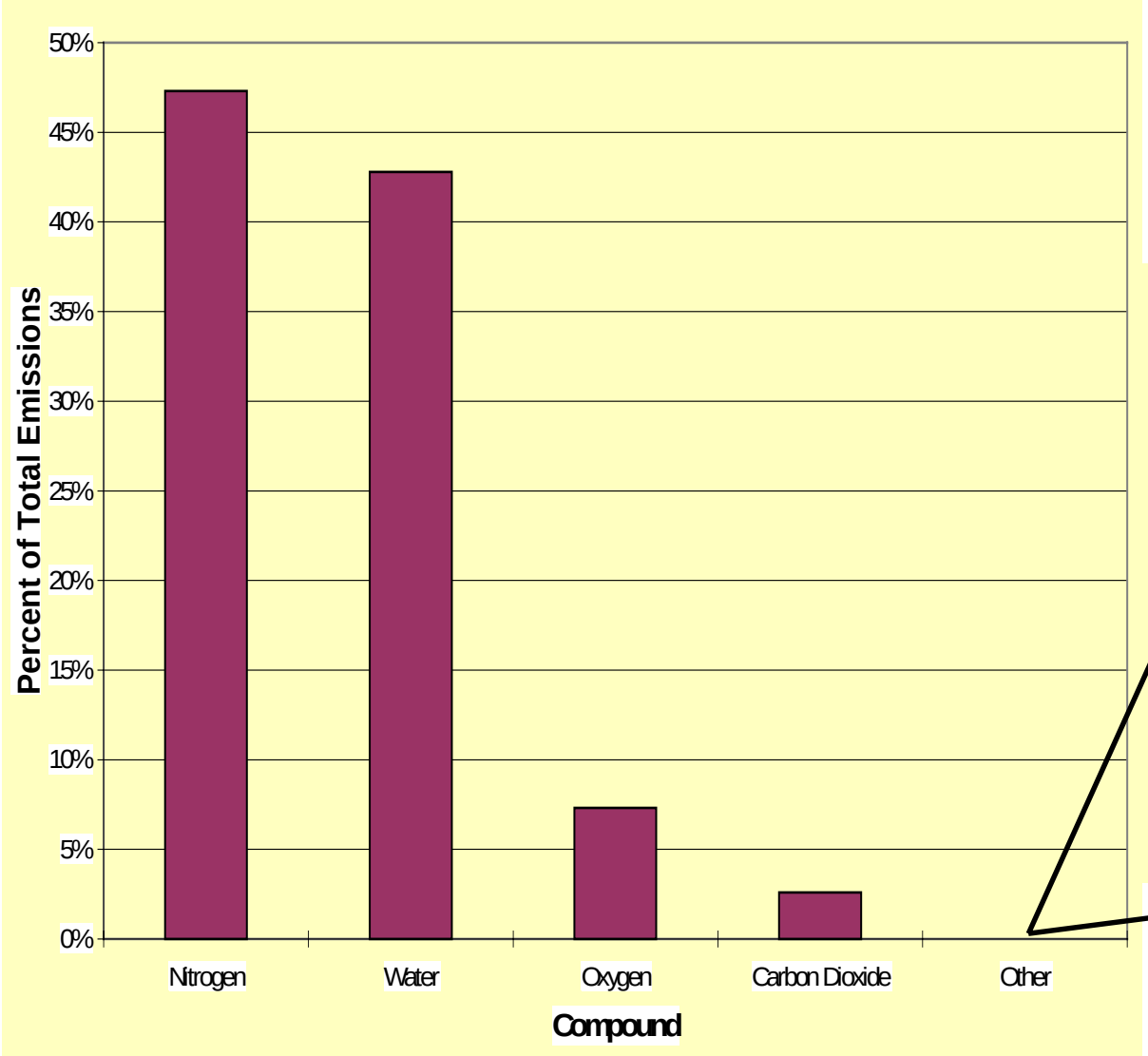

COMPARISON OF VOC EMISSIONS FROM TOCDF METAL PARTS FURNACE TRIAL BURN AND SCREENING RISK ASSESSMENT
(1 of 4)
Emission Rate (g/s)
4.5E-05
4.0E-05
3.5E-05
3.0E-05
2.5E-05
2.0E-05
1.5E-05
1.0E-05
5.0E-06
0.0E+00
1,1-Di-chloroethane
1,2-Di-chloropropane
cis-1,3-Di-chloropropene
trans-1,3-Di-chloropropene
1,1,2,2-Tetra-chloroethane
Xylenes
TOCDF Preliminary Risk Assessment Data
Screening Risk Assessment

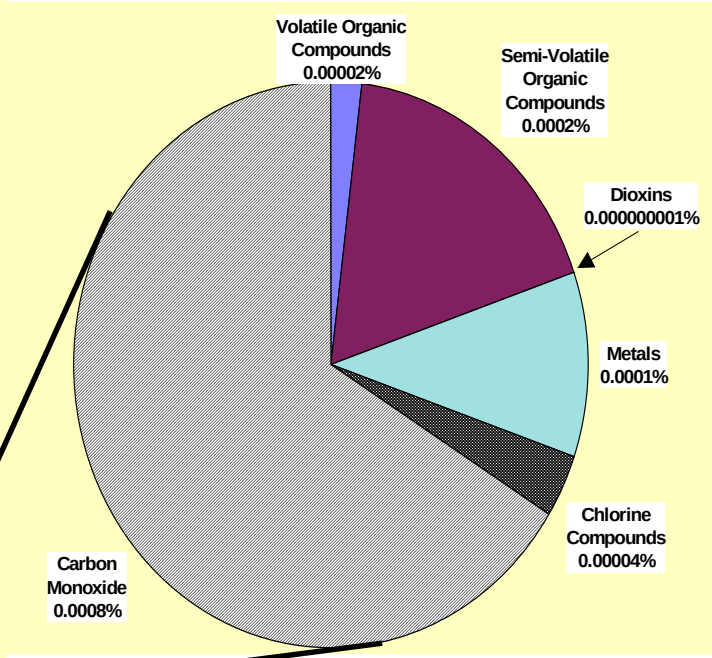

COMPARISON OF VOC EMISSIONS FROM TOCDF METAL PARTS FURNACE TRIAL BURN AND SCREENING RISK ASSESSMENT
(2 of 4)
Emission Rate (g/s)
6.0E-05
5.5E-05
5.0E-05
4.5E-05
4.0E-05
3.5E-05
3.0E-05
2.5E-05
2.0E-05
1.5E-05
1.0E-05
5.0E-06
0.0E+00
Ethylbenzene
Chloro-benzene
TCA
Carbon Tetrachloride
Chloro-methane
Vinyl Chloride
TOCDF Preliminary Risk Assessment Data
Screening Risk Assessment


COMPARISON OF METALS EMISSIONS FROM TOCDF METAL PARTS FURNACE
TRIAL BURN AND SCREENING RISK ASSESSMENT
(3 of 4)
Emission Rate (g/s)
1.0E-04
9.0E-05
8.0E-05
7.0E-05
6.0E-05
5.0E-05
4.0E-05
3.0E-05
2.0E-05
1.0E-05
0.0E+00
Benzene (10%)
Chloroform
Toluene
Methylene Chloride (10%)
Bromodichloro-methane
Bromoform
PCE
TOCDF Preliminary Risk Assessment Data
Screening Risk Assessment


COMPARISON OF METALS EMISSIONS FROM TOCDF METAL PARTS FURNACE
TRIAL BURN AND SCREENING RISK ASSESSMENT
(4 of 4)
Emission Rate (g/s)
3.0E-04
2.5E-04
2.0E-04
1.5E-04
1.0E-04
5.0E-05
0.0E+00
2-Hexanone
MIBK
Vinyl acetate
Carbon Disulfide
Styrene
Acetone
2-Butanone (10%)
TOCDF Preliminary Risk Assessment Data
Screening Risk Assessment

EMISSIONS FROM TOCDF METAL PARTS FURNACE



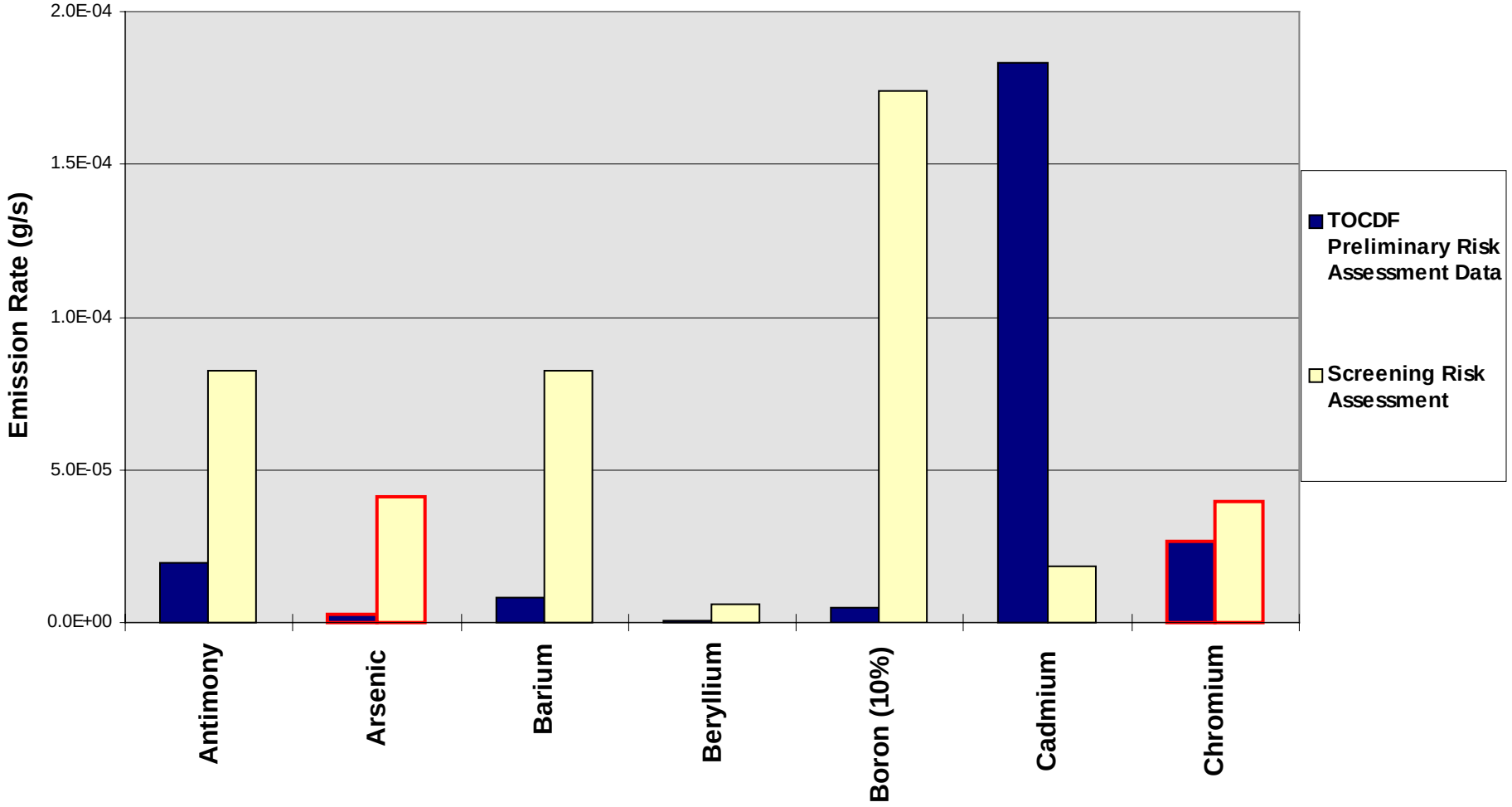


Deactivation Furnace System

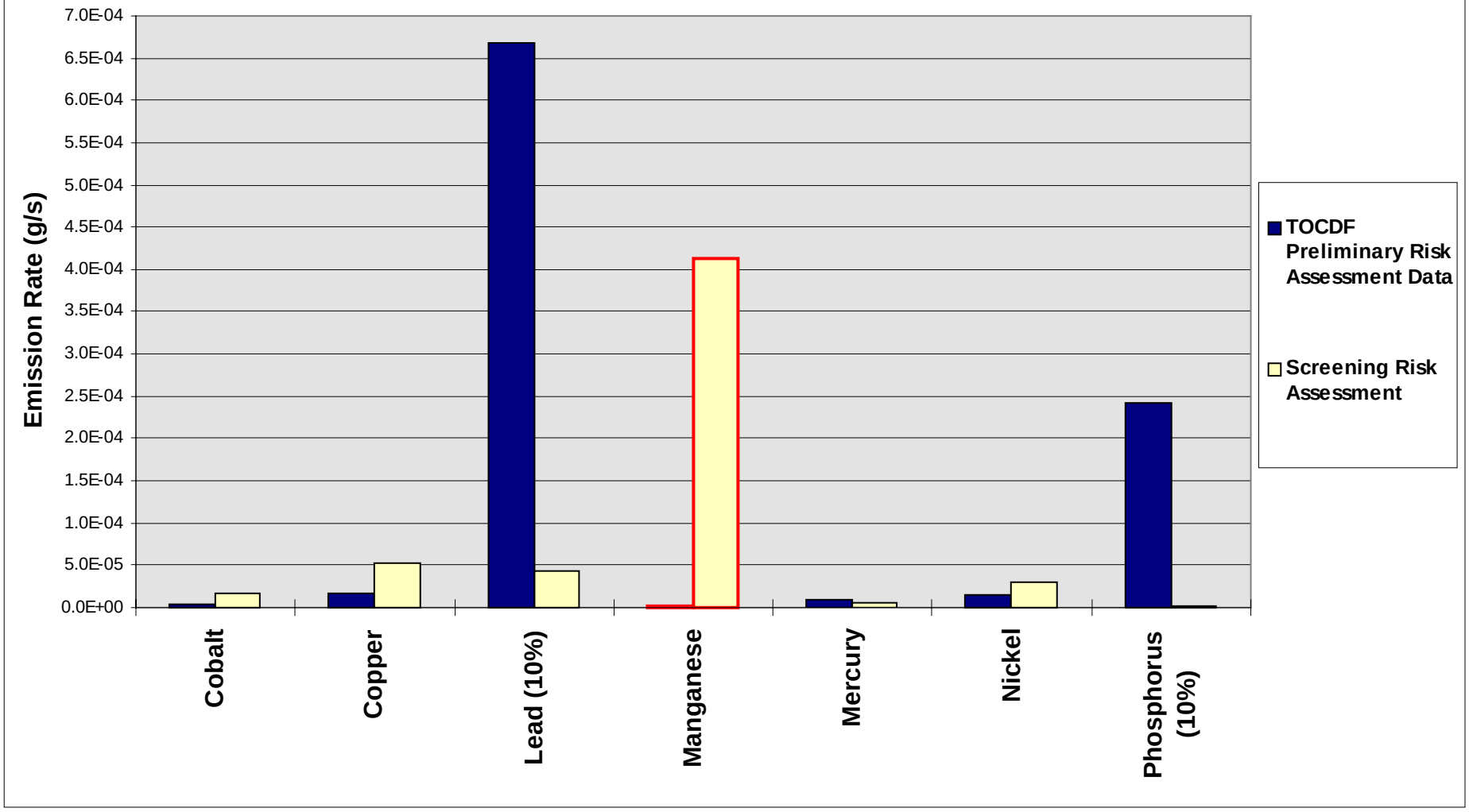
- The Deactivation Furnace System (DFS) is the source of 3 to 21 percent of the total risk calculated for 15 years of operation.

- Dioxins/furans, mustard (HD), manganese, and chromium are the most important chemicals because they contribute over 90 percent of the total risk from DFS emissions.

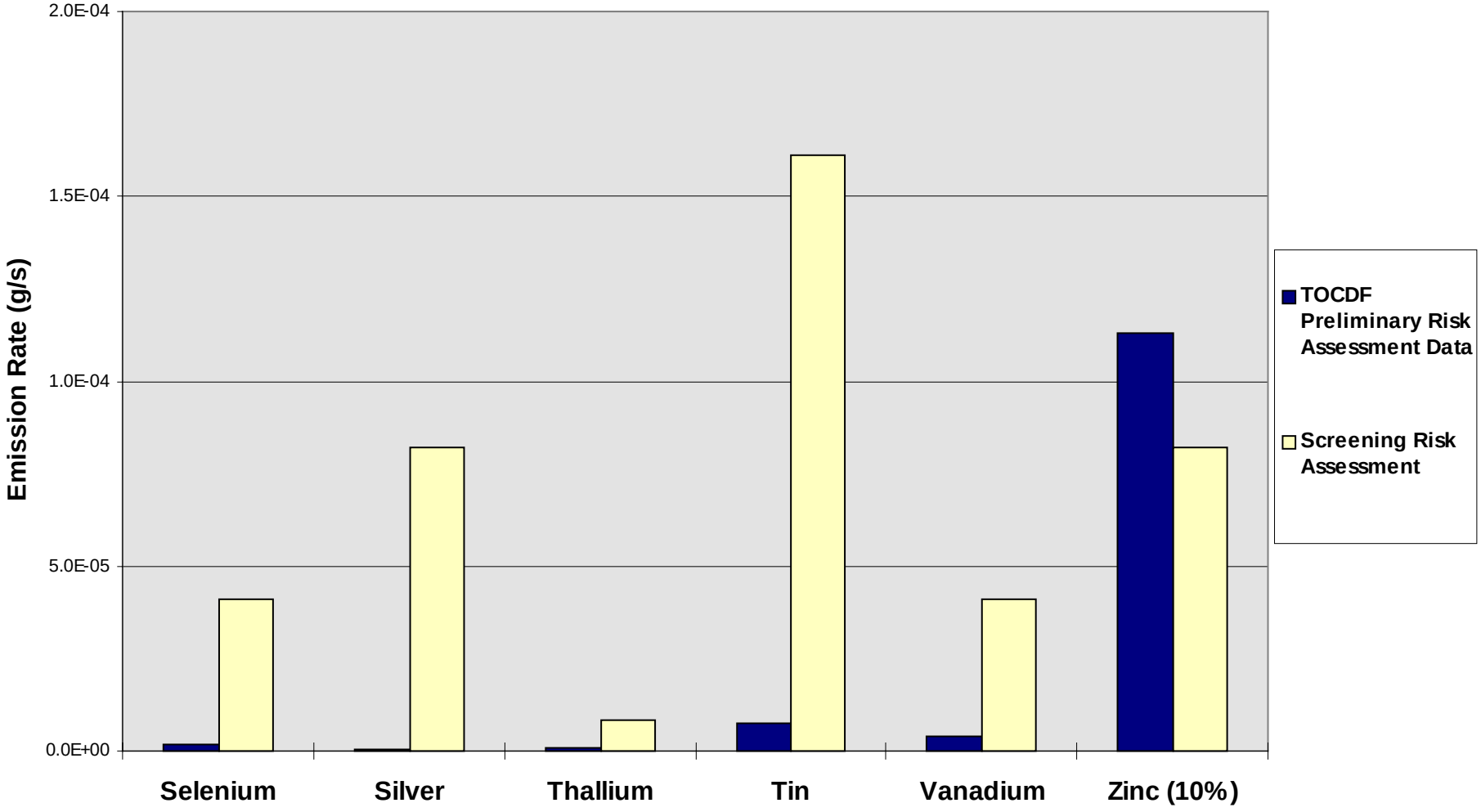
COMPARISON OF METALS EMISSIONS FROM TOCDF DEACTIVATION FURNACE TRIAL BURN AND SCREENING RISK ASSESSMENT
(1 of 3)

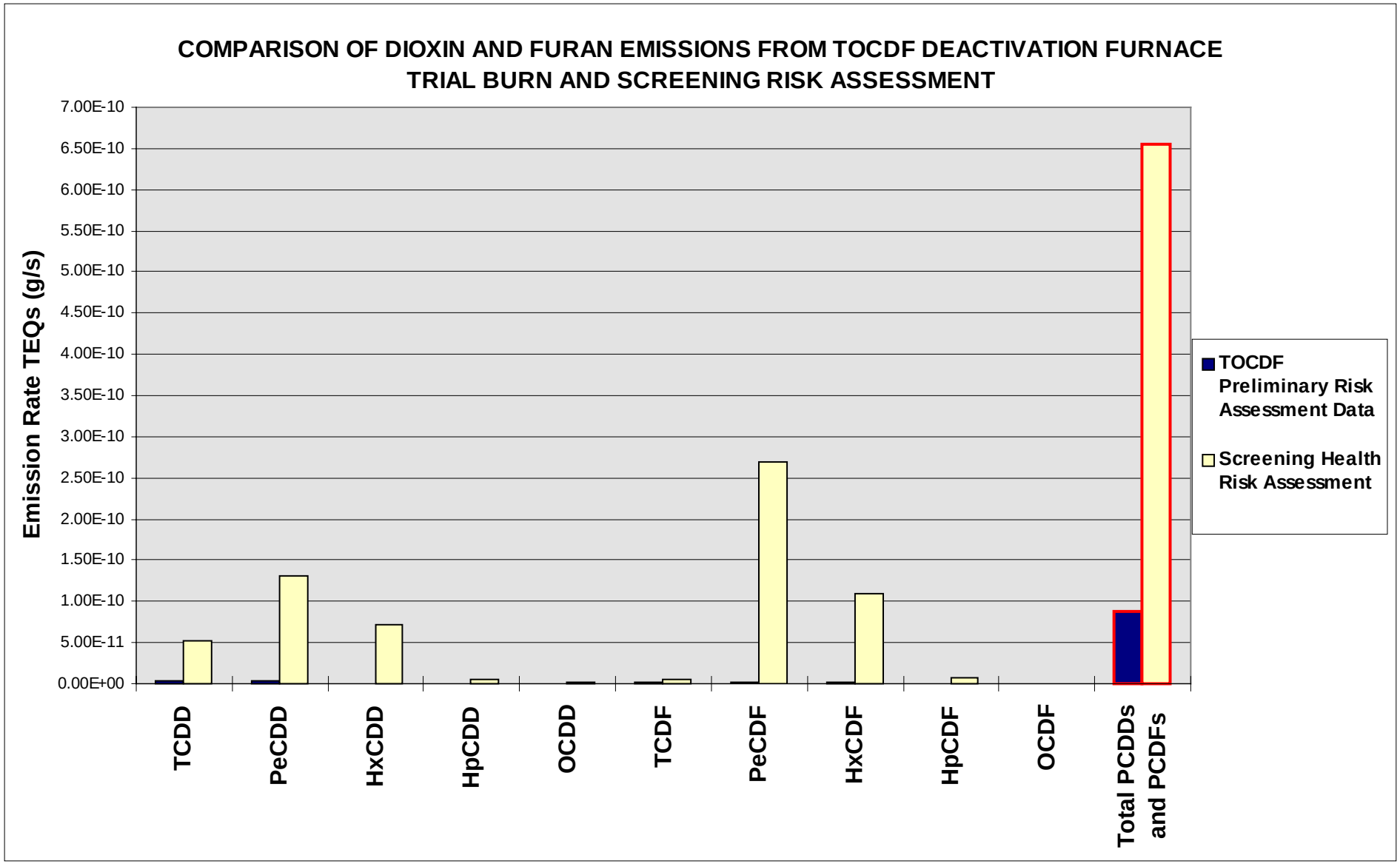


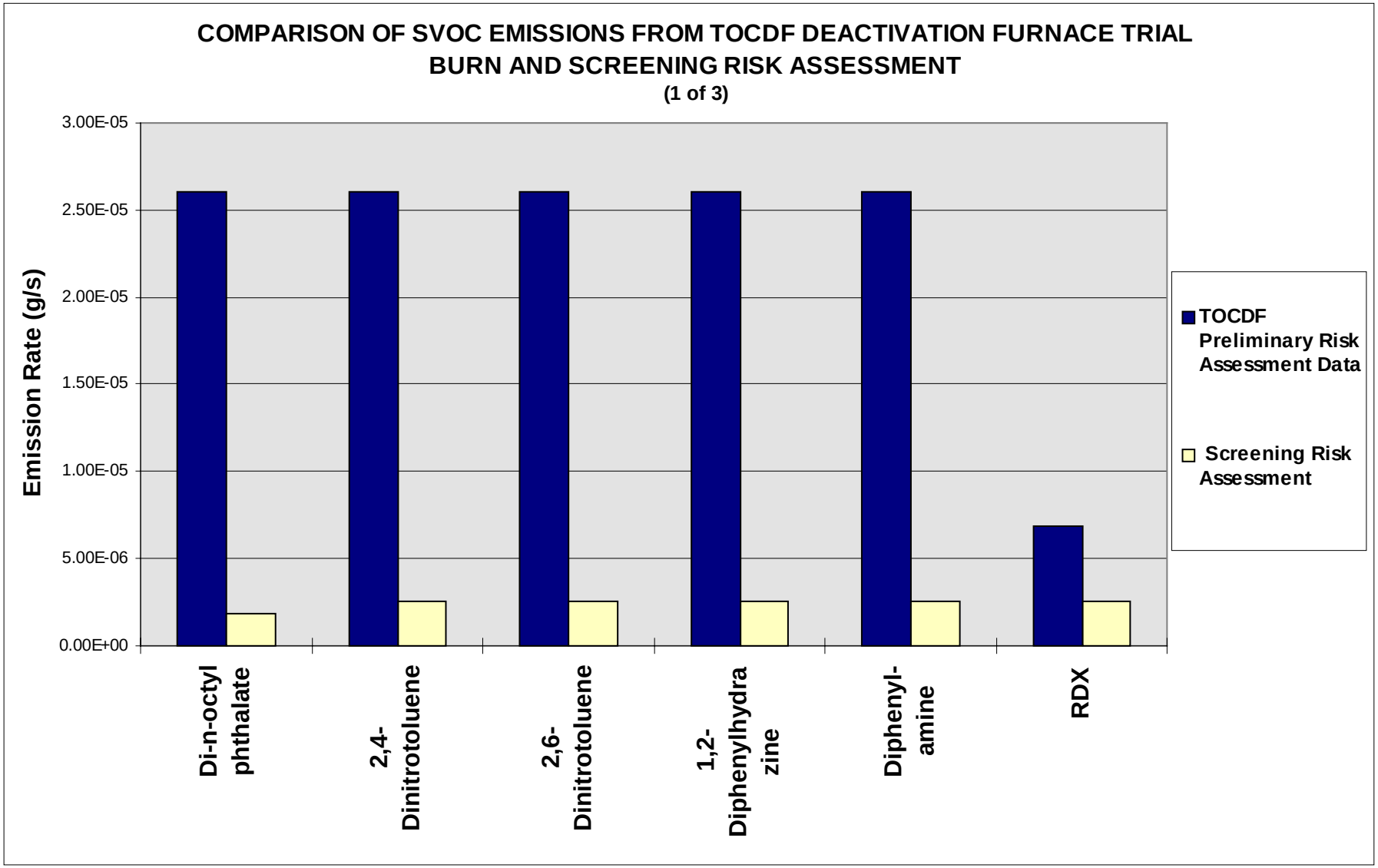
COMPARISON OF METALS EMISSIONS FROM TOCDF DEACTIVATION FURNACE TRIAL BURN AND SCREENING RISK ASSESSMENT
(2 of 3)



COMPARISON OF METALS EMISSIONS FROM TOCDF DEACTIVATION FURNACE TRIAL BURN AND SCREENING RISK ASSESSMENT
(3 of 3)

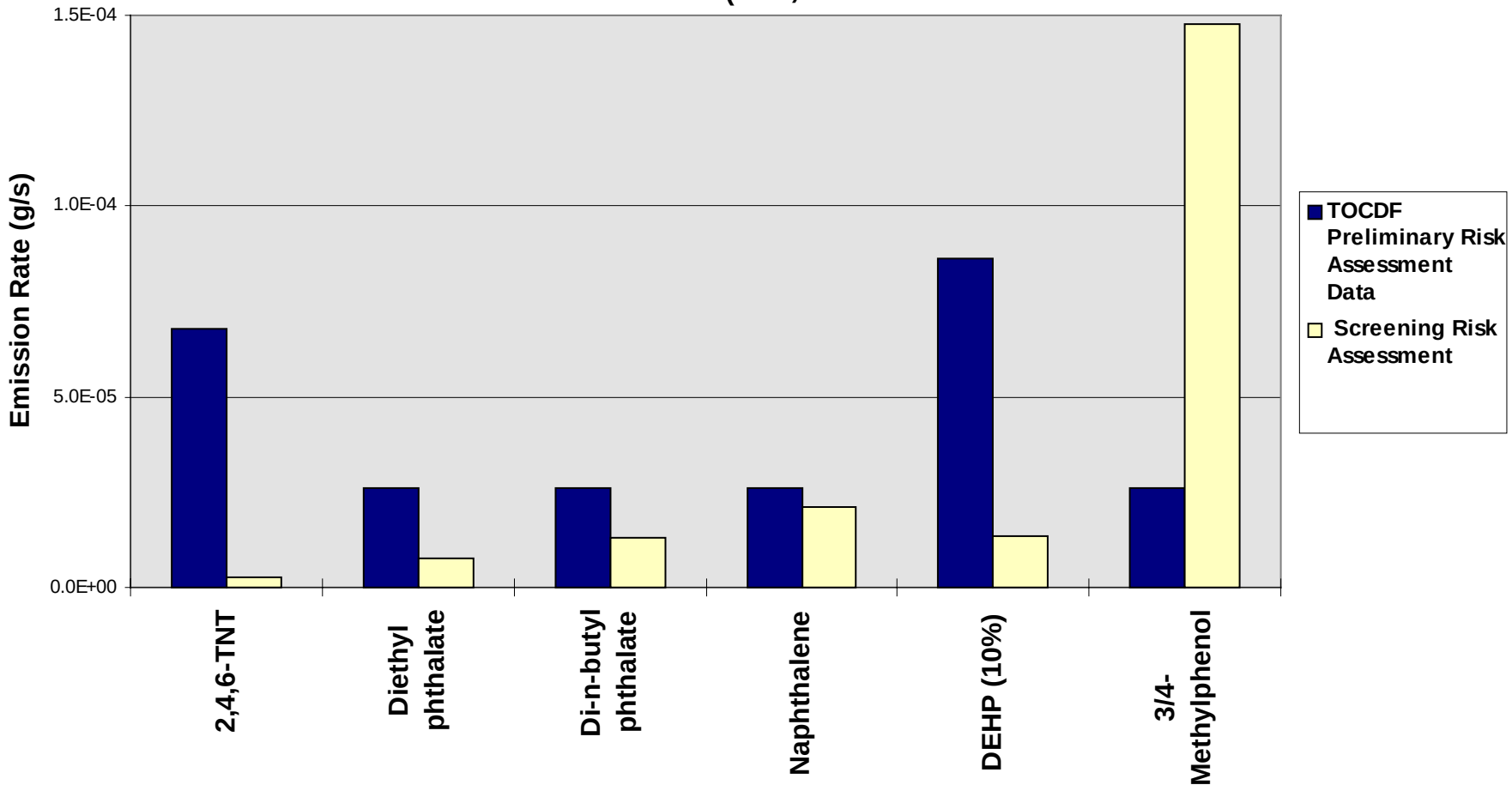



COMPARISON OF DIOXIN AND FURAN EMISSIONS FROM TOCDF DEACTIVATION FURNACE
TRIAL BURN AND SCREENING RISK ASSESSMENT
Emission Rate TEQs (g/s)
7.00E-10
6.50E-10
6.00E-10
5.50E-10
5.00E-10
4.50E-10
4.00E-10
3.50E-10
3.00E-10
2.50E-10
2.00E-10
1.50E-10
1.00E-10
5.00E-11
0.00E+00
TCDD
PeCDD
HxCDD
HpCDD
OCDD
TCDF
PeCDF
HxCDF
HpCDF
OCDF
Total PCDDs and PCDFs
TOCDF Preliminary Risk Assessment Data
Screening Health Risk Assessment

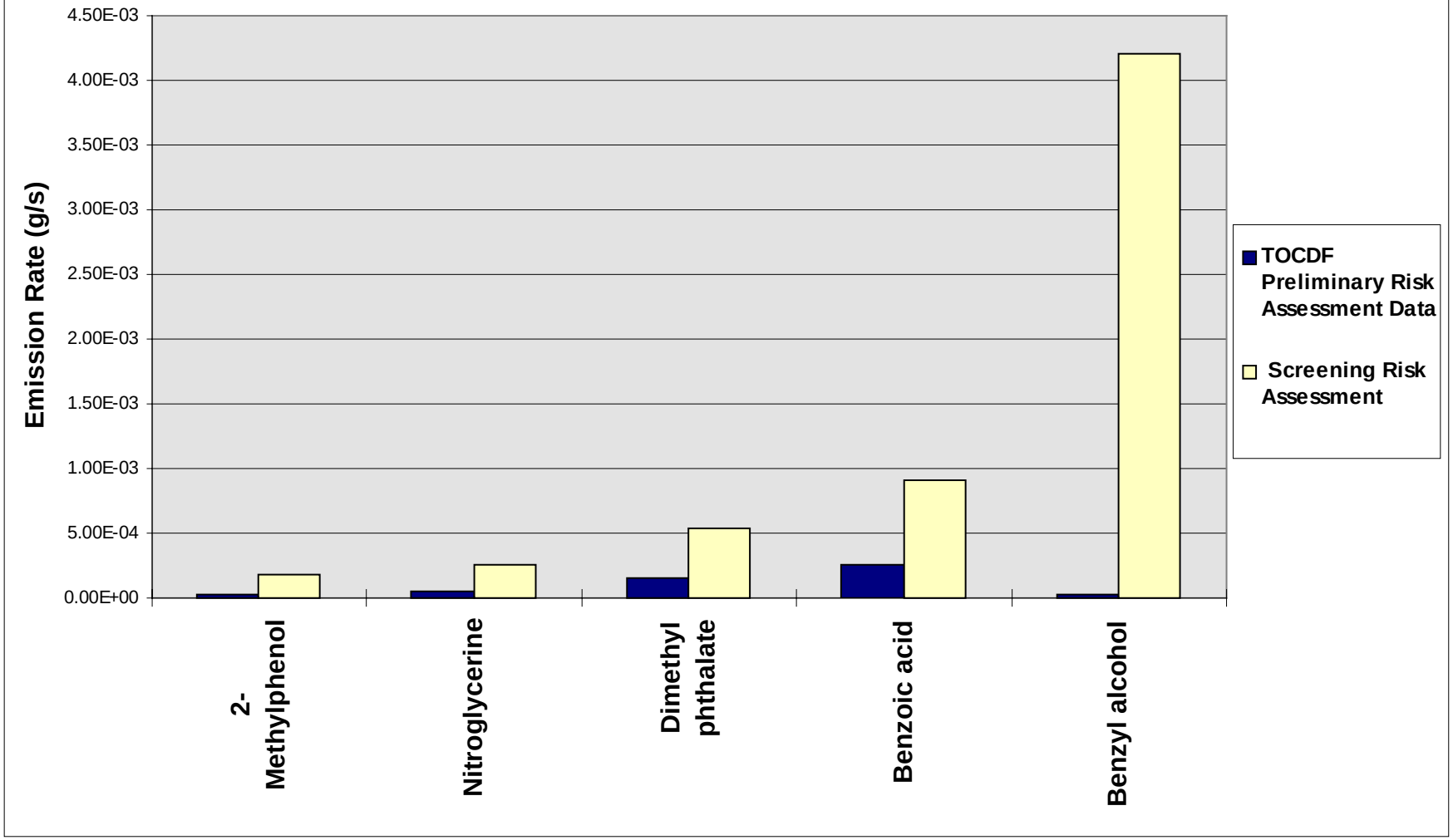

COMPARISON OF SVOC EMISSIONS FROM TOCDF DEACTIVATION FURNACE TRIAL BURN AND SCREENING RISK ASSESSMENT
(1 of 3)
Emission Rate (g/s)
3.00E-05
2.50E-05
2.00E-05
1.50E-05
1.00E-05
5.00E-06
0.00E+00
Di-n-octyl phthalate
2,4-Dinitrotoluene
2,6-Dinitrotoluene
1,2-Diphenylhydrazine
Diphenyl-amine
RDX
TOCDF Preliminary Risk Assessment Data
Screening Risk Assessment

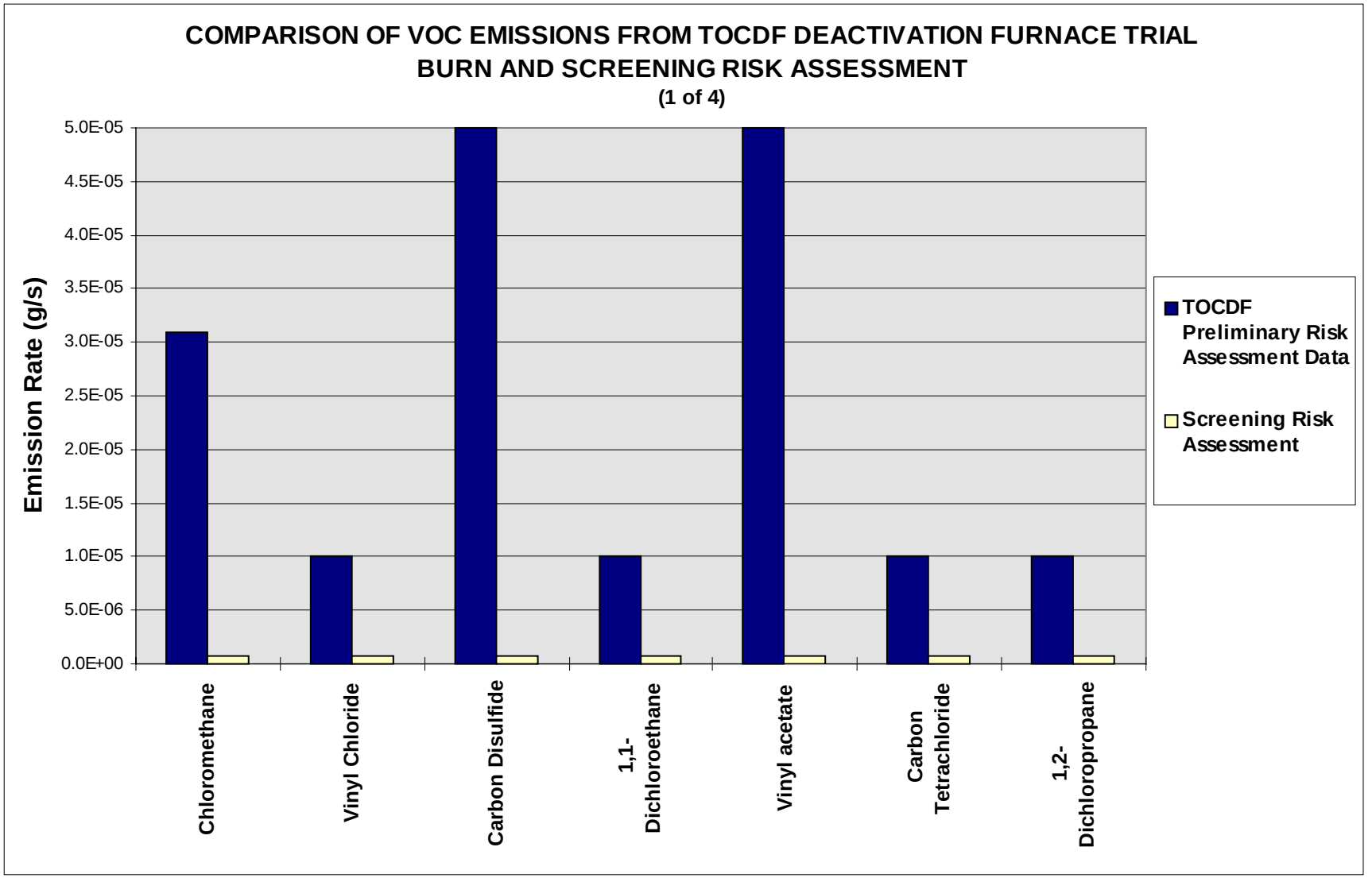
COMPARISON OF SVOC EMISSIONS FROM TOCDF DEACTIVATION FURNACE TRIAL BURN AND SCREENING RISK ASSESSMENT

(2 of 3)

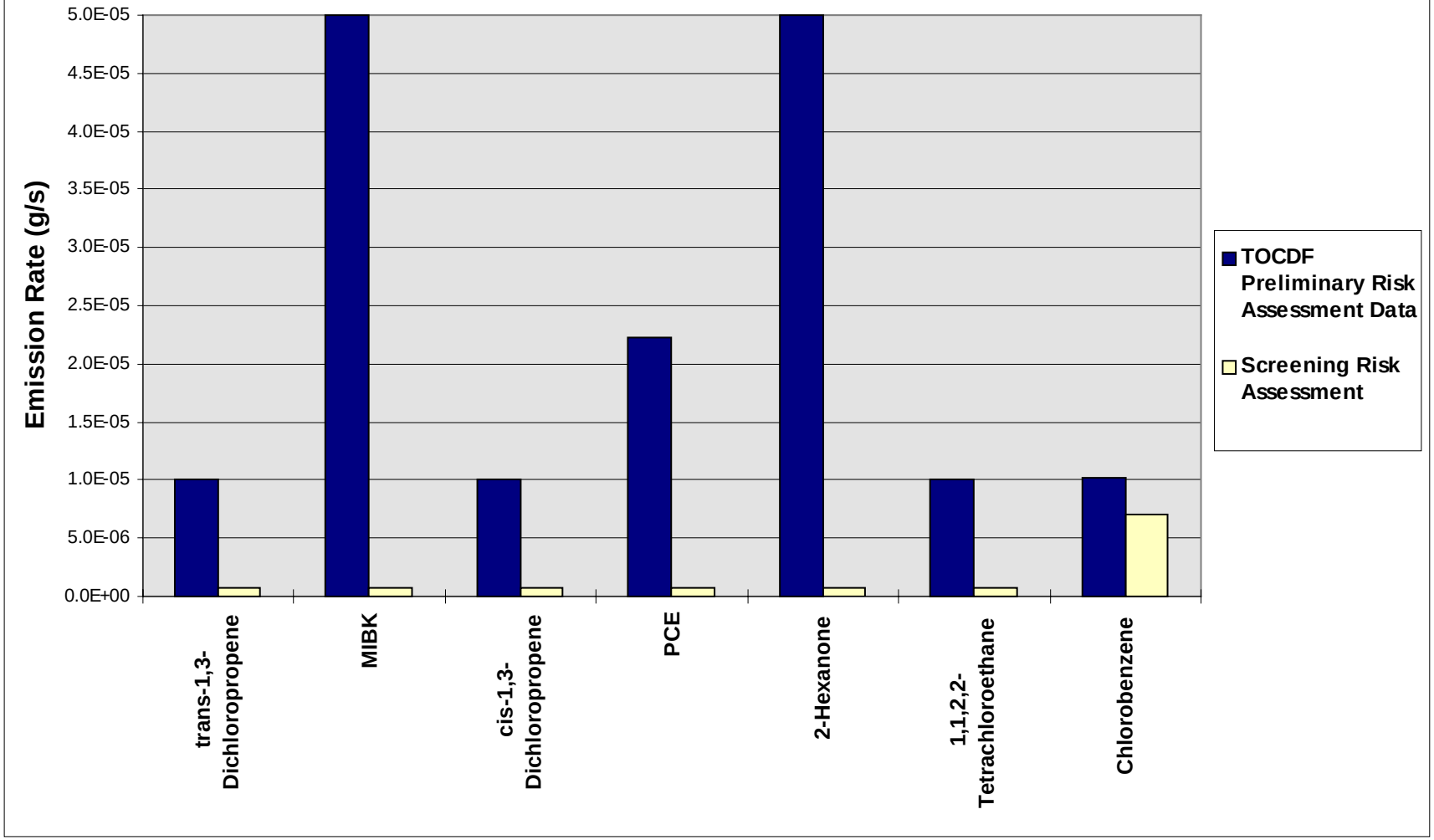


COMPARISON OF SVOC EMISSIONS FROM TOCDF DEACTIVATION FURNACE TRIAL BURN AND SCREENING RISK ASSESSMENT
(3 of 3)



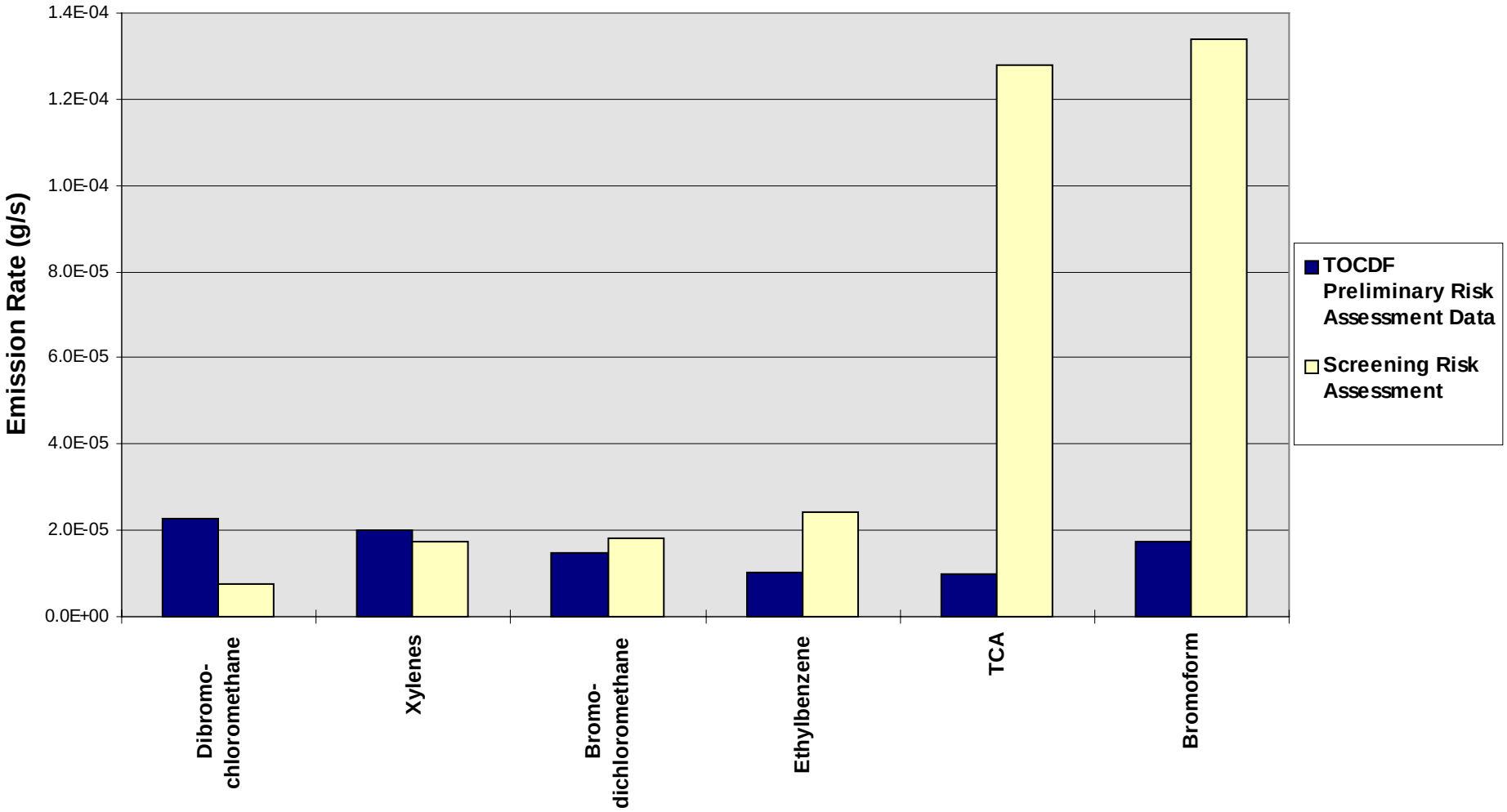

COMPARISON OF VOC EMISSIONS FROM TOCDF DEACTIVATION FURNACE TRIAL BURN AND SCREENING RISK ASSESSMENT
(1 of 4)
Emission Rate (g/s)
5.0E-05
4.5E-05
4.0E-05
3.5E-05
3.0E-05
2.5E-05
2.0E-05
1.5E-05
1.0E-05
5.0E-06
0.0E+00
Chloromethane
Vinyl Chloride
Carbon Disulfide
1,1-Dichloroethane
Vinyl acetate
Carbon Tetrachloride
1,2-Dichloropropane
TOCDF Preliminary Risk Assessment Data
Screening Risk Assessment

COMPARISON OF VOC EMISSIONS FROM TOCDF DEACTIVATION FURNACE TRIAL BURN AND SCREENING RISK ASSESSMENT
(2 of 4)

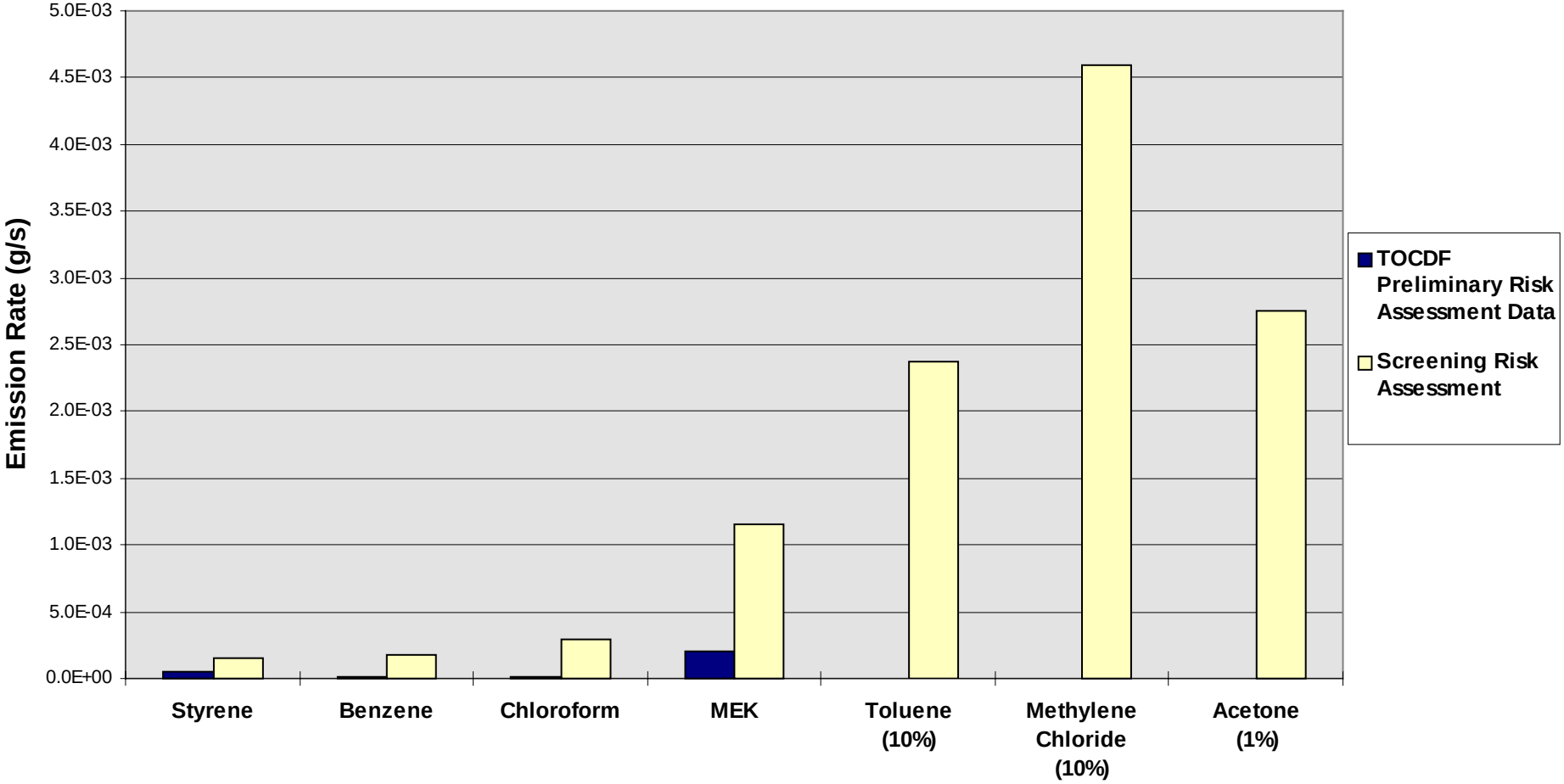


COMPARISON OF VOC EMISSIONS FROM TOCDF DEACTIVATION FURNACE TRIAL BURN AND SCREENING RISK ASSESSMENT

(3 of 4)



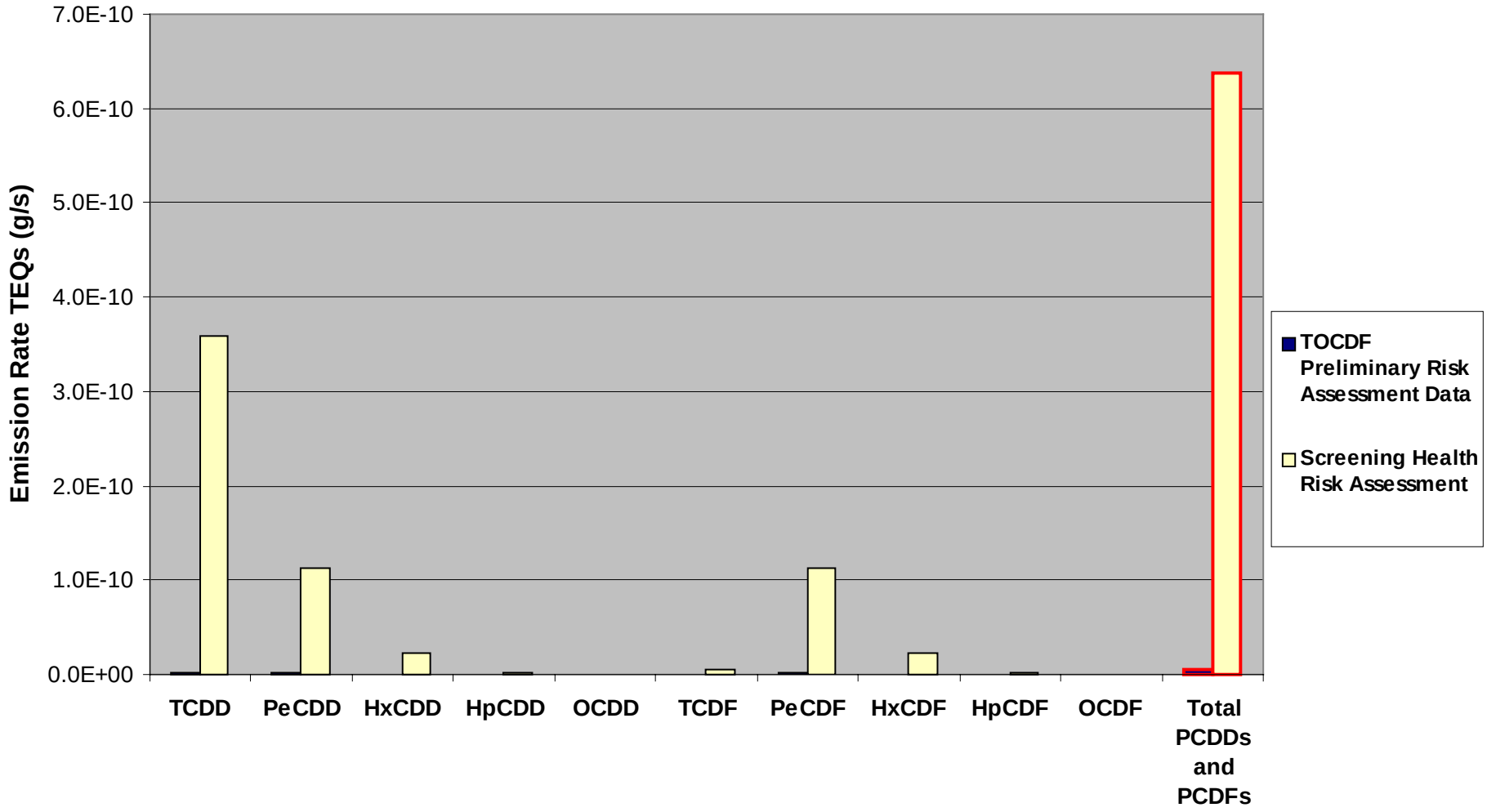
COMPARISON OF VOC EMISSIONS FROM TOCDF DEACTIVATION FURNACE TRIAL BURN AND SCREENING RISK ASSESSMENT
(4 of 4)

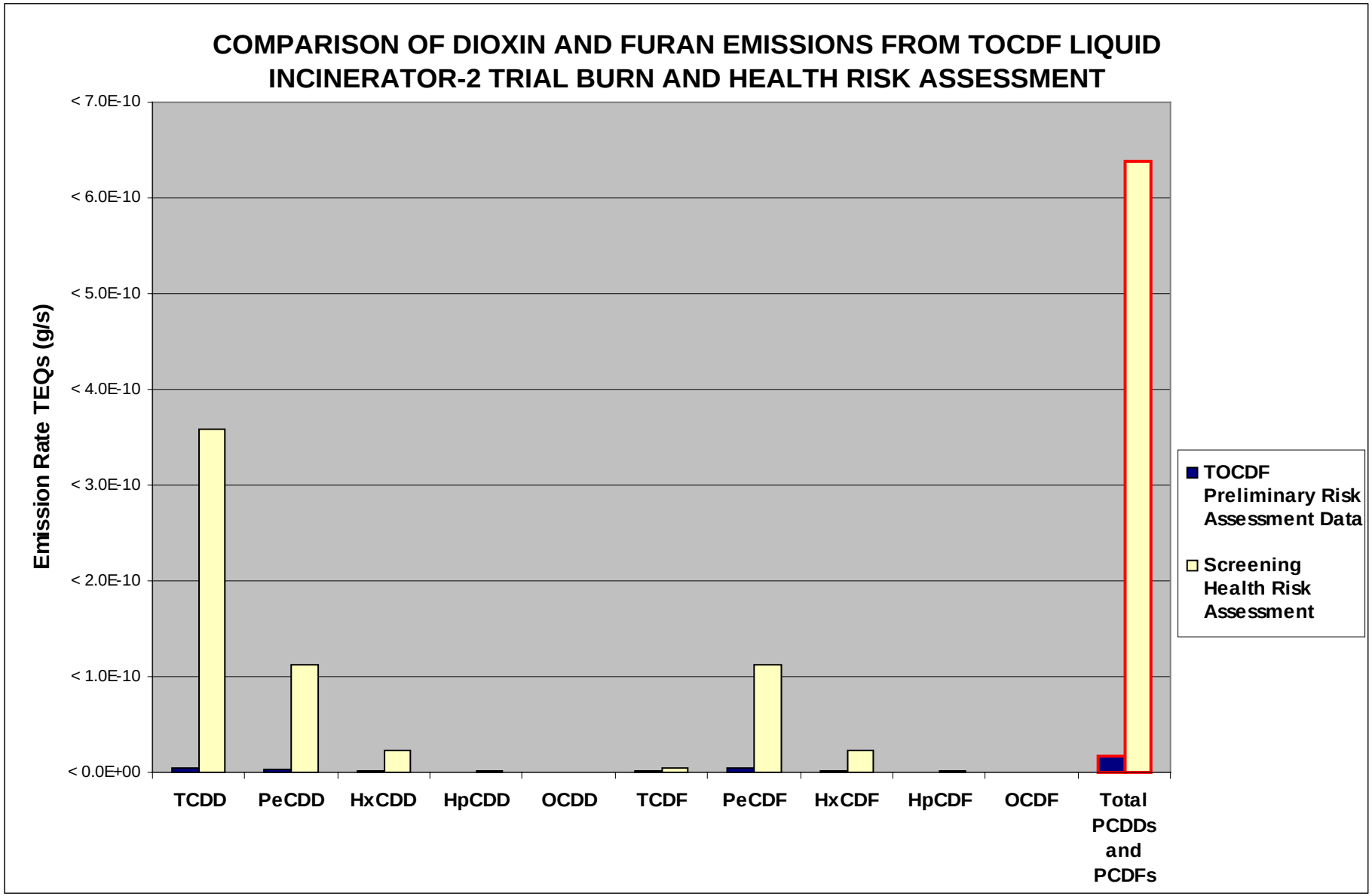


Liquid Incinerators (2)

- The Liquid Incinerators are the source of 9 to 20 percent of the total risk calculated for 15 years of operation.
- Dioxins/furans, mustard (HD), beryllium, chromium, and dichloropropene contribute the majority of the risk from the LIC emissions

COMPARISON OF DIOXIN AND FURAN EMISSIONS FROM TOCDF LIQUID INCINERATOR-1 TRIAL BURN AND HEALTH RISK ASSESSMENT




COMPARISON OF DIOXIN AND FURAN EMISSIONS FROM TOCDF LIQUID INCINERATOR-2 TRIAL BURN AND HEALTH RISK ASSESSMENT
Emission Rate TEQs (g/s)
< 7.0E-10
< 6.0E-10
< 5.0E-10
< 4.0E-10
< 3.0E-10
< 2.0E-10
< 1.0E-10
< 0.0E+00
TCDD
PeCDD
HxCDD
HpCDD
OCDD
TCDF
PeCDF
HxCDF
HpCDF
OCDF
Total PCDDs and PCDFs
TOCDF Preliminary Risk Assessment Data
Screening Health Risk Assessment

TRIAL BURN DATA AND RISK ASSESSMENT

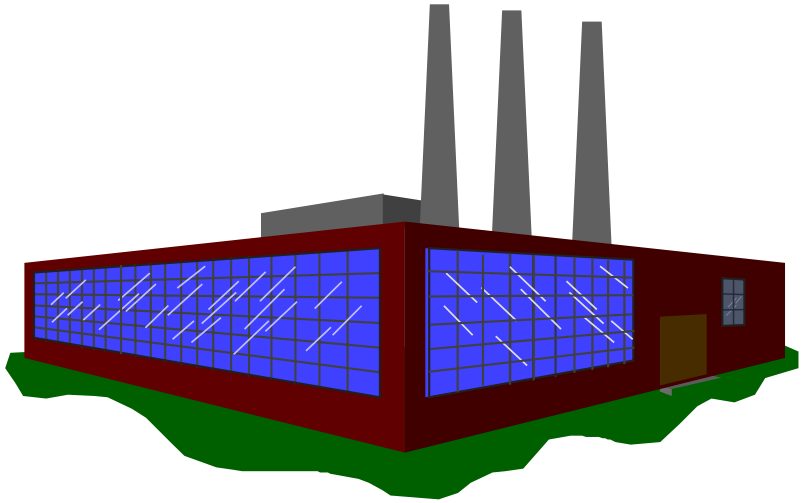
- **Conclusions:**
  - **The preliminary results of the GB-agent trial burns for the Deactivation Furnace and Metal Parts Furnace support the Screening Risk Assessment conclusion of no adverse health effects.**
  - **An initial review of the GB-agent trial burn results for the Liquid Incinerators also supports the conclusion of no adverse health effects.**

ONGOING and FUTURE RISK ASSESSMENT

- Ecological Risk Assessment
- Human Health Risk Assessment

HUMAN HEALTH RISK ASSESSMENT

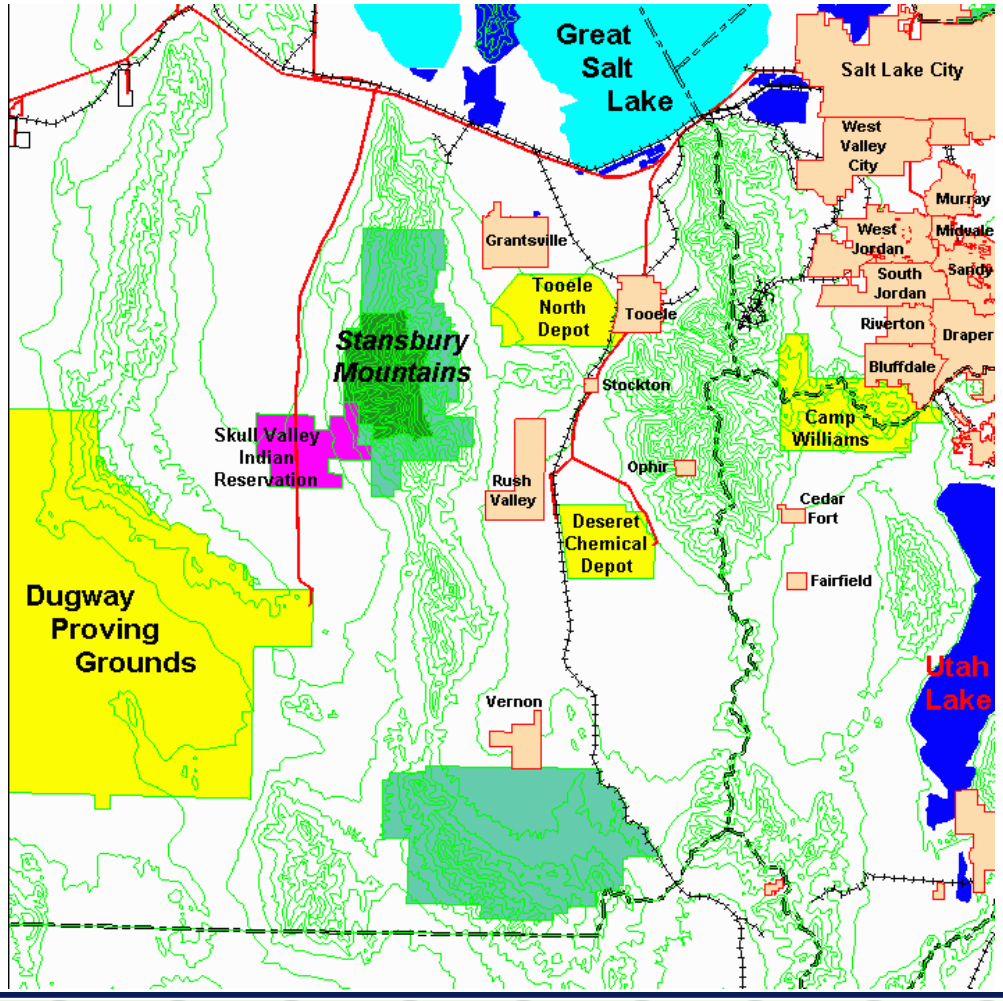
- Update with TOCDF Trial Burn data



HUMAN HEALTH RISK ASSESSMENT

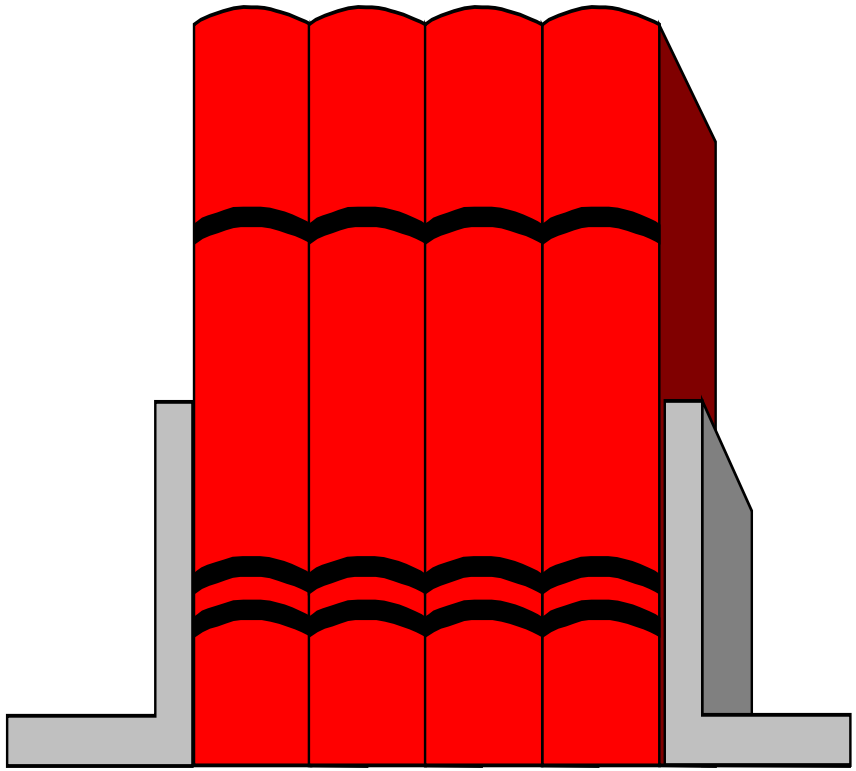
- Update Air Dispersion Modeling with recently released USEPA ISCST3 Model

HUMAN HEALTH RISK ASSESSMENT



3. Review assumptions regarding potentially exposed populations

HUMAN HEALTH RISK ASSESSMENT



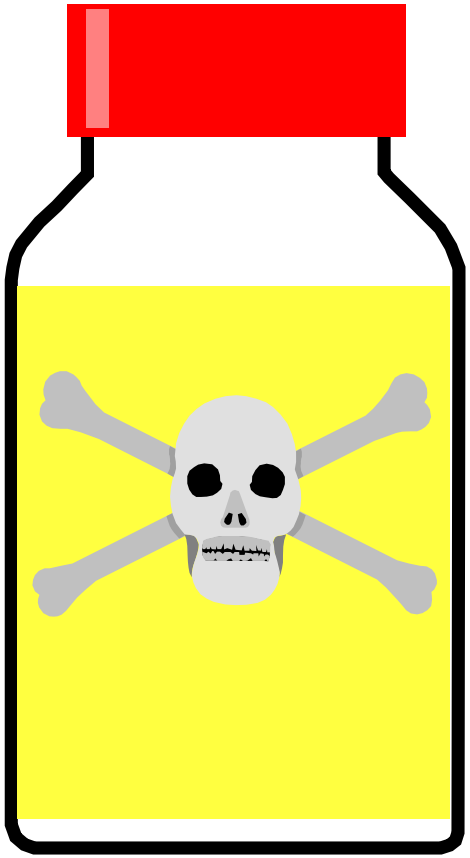
- Reissue Updated Risk Assessment
  - trial burns
  - air modeling
  - exposure data

PUBLIC PARTICIPATION

- Draft Protocol (before calculations are done)
- Draft Risk Assessment
- Informal comments anytime

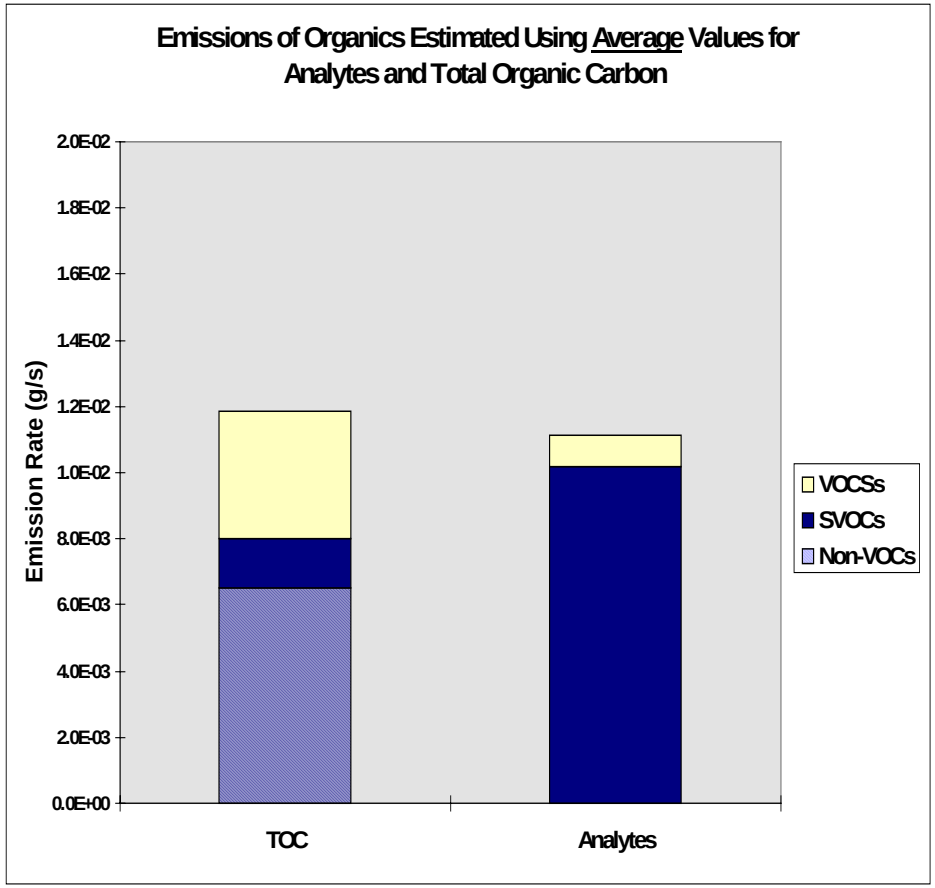
TOCDF Risk Assessment

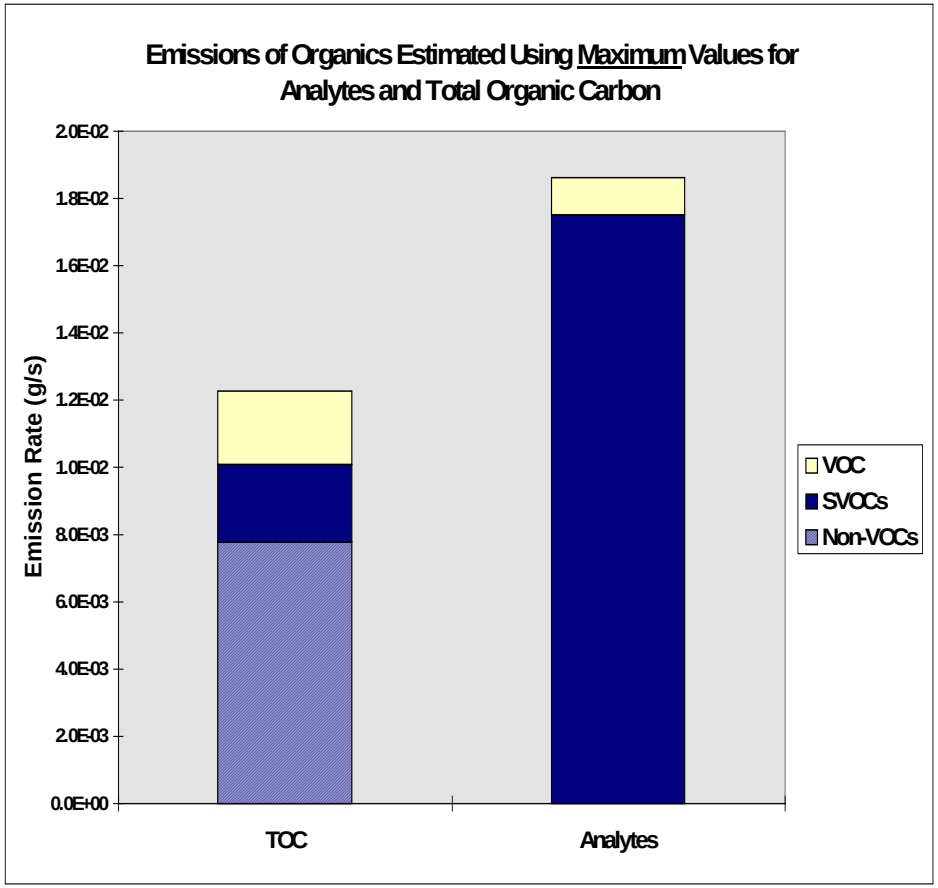
- Army has proposed Oral Reference Doses and Slope Factors for chemical agents
  - Currently being reviewed by National Committee of Toxicology
  - Army will submit to EPA
  - Values similar to those previously derived by Utah



THANK YOU

Preliminary Estimates of MPF Emissions





Preliminary Estimates of DFS Emissions